Internal Use Only

Service Manual

LG-E510

Date: September, 2011 / Issue 1.0

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1. INTRODUCTION

1.1 Purpose

This manual provides the information necessary to repair, calibration, description and download the features of this model.

1.2 Regulatory Information

A. Security

Toll fraud, the unauthorized use of telecommunications system by an unauthorized part (for example, persons other than your company's employees, agents, subcontractors, or person working on your company's behalf) can result in substantial additional charges for your telecommunications services. System users are responsible for the security of own system. There are may be risks of toll fraud associated with your telecommunications system. System users are responsible for programming and configuring the equipment to prevent unauthorized use. The manufacturer does not warrant that this product is immune from the above case but will prevent unauthorized use of common carrier telecommunication service of facilities accessed through or connected to it. The manufacturer will not be responsible for any charges that result from such unauthorized use.

B. Incidence of Harm

If a telephone company determines that the equipment provided to customer is faulty and possibly causing harm or interruption in service to the telephone network, it should disconnect telephone service until repair can be done. A telephone company may temporarily disconnect service as long as repair is not done.

C. Changes in Service

A local telephone company may make changes in its communications facilities or procedure. If these changes could reasonably be expected to affect the use of the phones or compatibility with the net work, the telephone company is required to give advanced written notice to the user, allowing the user to take appropriate steps to maintain telephone service.

D. Maintenance Limitations

Maintenance limitations on the phones must be performed only by the manufacturer or its authorized agent. The user may not make any changes and/or repairs expect as specifically noted in this manual. Therefore, note that unauthorized alternations or repair may affect the regulatory status of the system and may void any remaining warranty.

E. Notice of Radiated Emissions

This model complies with rules regarding radiation and radio frequency emission as defined by local regulatory agencies. In accordance with these agencies, you may be required to provide information such as the following to the end user.

F. Pictures

The pictures in this manual are for illustrative purposes only; your actual hardware may look slightly different.

G. Interference and Attenuation

A phone may interfere with sensitive laboratory equipment, medical equipment, etc. Interference from unsuppressed engines or electric motors may cause problems.

H. Electrostatic Sensitive Devices

ATTENTION

Boards, which contain Electrostatic Sensitive Device (ESD), are indicated by the  **sign.**

Following information is ESD handling:

• Service personnel should ground themselves by using a wrist strap when exchange system boards. • When repairs are made to a system board, they should spread the floor with anti-static mat which is also grounded.

• Use a suitable, grounded soldering iron. • Keep sensitive parts in these protective packages until these are used.

• When returning system boards or parts like EEPROM to the factory, use the protective package as described.

1.3 Abbreviations

For the purposes of this manual, following abbreviations apply:

APC	Automatic Power Control
BB	Baseband
BER	Bit Error Ratio
CC-CV	Constant Current – Constant Voltage
DAC	Digital to Analog Converter
DCS	Digital Communication System
dBm	dB relative to 1 milli watt
DSP	Digital Signal Processing
EEPROM	Electrical Erasable Programmable Read-Only Memory
ESD	Electrostatic Discharge
FPCB	Flexible Printed Circuit Board
GMSK	Gaussian Minimum Shift Keying
GPIB	General Purpose Interface Bus
GSM	Global System for Mobile Communications
IPUI	International Portable User Identity
IF	Intermediate Frequency
LCD	Liquid Crystal Display
LDO	Low Drop Output
LED	Light Emitting Diode
OPLL	Offset Phase Locked Loop

PAM	Power Amplifier Module
PCB	Printed Circuit Board
PGA	Programmable Gain Amplifier
PLL	Phase Locked Loop
PSTN	Public Switched Telephone Network
RF	Radio Frequency
RLR	Receiving Loudness Rating
RMS	Root Mean Square
RTC	Real Time Clock
SAW	Surface Acoustic Wave
SIM	Subscriber Identity Module
SLR	Sending Loudness Rating
SRAM	Static Random Access Memory
PSRAM	Pseudo SRAM
STMR	Side Tone Masking Rating
TA	Travel Adapter
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
UART	Universal Asynchronous Receiver/Transmitter
VCO	Voltage Controlled Oscillator
VCTCXO	Voltage Control Temperature Compensated Crystal Oscillator
WAP	Wireless Application Protocol

2. PERFORMANCE

2.1 Product Name

E510 : WCDMA900 /2100+EGSM/GSM850/DCS/PCS

(HSDPA 3.6Mbps GPRS Class 12 / EDGE Class 12)

2.2 Supporting Standard

Item	Feature	Comment
Supporting Standard	WCDMA(FDD1,8)/EGSM/GSM850/DCS1800/PCS1900 with seamless handover Phase 2+(include AMR) SIM Toolkit: Class 1, 2, 3, C-E	
Frequency Range	WCDMA(FDD1) TX : 1920 – 1980 MHz WCDMA(FDD1) RX : 2110 – 2170 MHz WCDMA(FDD8) TX : 880~915 MHz WCDMA(FDD8) RX : 925~960 MHz EGSM TX: 880 – 915 MHz EGSM RX: 925 – 960 MHz GSM850 TX: 824 – 849 MHz GSM850 RX: 869 – 894 MHz DCS1800 TX : 1710 – 1785 MHz DCS1800 RX: 1805 – 1880 MHz PCS1900 TX: 1850 – 1910 MHz PCS1900 RX: 1930 – 1990 MHz	
Application Standard	WAP 2.0	

2.3 Main Parts : GSM Solution

Item	Part Name	Comment
Digital Baseband	MSM7227T : Qualcomm	
Analog Baseband	PM7540 : Qualcomm	
RF Chip	RTR6285 : Qualcomm	

2.4 HW Features

Item		Feature	Comment
Form Factor		DOP type	
Battery		1) Capacity Standard : Li-Ion , 1500mAh	
		2) Packing Type : Soft Pack	
Size		Standard : 113.4 x 60.8 x 11.9mm	
Weight		124g	With Battery
Volume		76cc	
PCB		L1F1 type, 8 Layers , 0.8t	
Stand by time		2G Up to 580 hrs 3G Up to 510 hrs	@ Paging Period 9 (2G) @ DRX 8 (3G)
Charging time		3 hrs	@ Power Off / 1500mAh
Talk time		2G Up to 450mins 3G Up to 420mins	@ Power Level 10 (2G) @ Tx = 0dBm (3G)
RX sensitivity		WCDMA(FDD1) : -106.7 dBm WCDMA(FDD5) : -104.7 dBm EGSM : -105 dBm GSM850 : -105 dBm DCS 1800 : -105 dBm PCS 1900 : -105 dBm	
TX output power	WCDMA/ GSM/ GPRS	WCDMA : 24dBm/3.84MHz,+1/-3dBm EGSM : 33dBm GSM850 : 33 dBm DCS 1800 : 30 dBm PCS 1900 : 30 dBm	Class3(WCDMA) Class4 (EGSM) Class4 (GSM850) Class1 (PCS) Class1 (DCS)
	EDGE	GSM 900 : 27 dBm DCS 1800 : 26 dBm PCS 1900 : 26 dBm	E2 (GSM900) E2 (PCS) E2 (DCS)
GPRS compatibility		GPRS Class 12	
EDGE compatibility		EDGE Class 12	
SIM card type		Plug-In SIM 3V /1.8V	

Display	Main LCD TFT Main LCD(3.5', 320 x 480)	
Built-in Camera	5M AF CMOS Camera	
Status Indicator	No	
Keypad	Function key : 1 Side Key : 2 Power key : 1	Function Key: Home, Back, Menu, Side Key : Volume up/down
ANT	Main : Internal Fixed Type	
System connector	5 Pin	
Ear Phone Jack	3.5Phi, 4 Pole, Stereo	
PC synchronization	Yes	
Memory	NAND Flash : 4Gbit SDRAM : 4Gbit	
Speech coding	FR, EFR, HR,AMR	
Data & Fax	Built in Data & Fax support	
Vibrator	Built in Vibrator	
Blue Tooth	V3.0	
MIDI(for Buzzer Function)	SW Decoded 72Poly	
Music Player	MP3/ WMA/AAC/HE-AAC/EAAC+	
Video Player	MPEG4, H.263, H.264	
Camcorder	MPEG4, H.263, H.264	
Voice Recording	Yes	
Speaker Phone mode Support	Yes	
Travel Adapter	Yes	
CDROM	No	
Stereo Headset	Yes	
Data Cable	Yes	
T-Flash (External Memory)	Yes	

2.5 SW Features

Item	Feature	Comment
RSSI	0 ~ 4 Levels	
Battery Charging	0 ~ 6 Levels	
Key Volume	0 ~ 7 Level	
Audio Volume	1 ~ 15 Level	
Time / Date Display	Yes	
Multi-Language	Yes	English/French/German/Spanish/Italian/Danish/Dutch/Korean
Quick Access Mode	Dialing/ Contact / Menu / Message / Camera	
PC Sync	No	
Speed Dial	No	Voice mail center -> 1 key
Profile	Yes	not same with feature phone setting
CLIP / CLIR	Yes	
Phone Book	Name / Number / Email / Chat Id/ Website/Postal addresses/Organizations/Groups/ BirthdayNotes / Ringtone	There is no limitation on the number of items. It depends on available memory amount.
Last Dial Number	Yes	Last Dial Numbers, Last Received Numbers and Last Missed Numbers can store up to a total of 500.
Last Received Number	Yes	Last Dial Numbers, Last Received Numbers and Last Missed Numbers can store up to a total of 500.
Last Missed Number	Yes	Last Dial Numbers, Last Received Numbers and Last Missed Numbers can store up to a total of 500.
Search by Number / Name	Name	
Group	Yes	There is no limitation on the number of items. It depends on available memory amount.
Fixed Dial Number	Yes	

Service Dial Number	No	
Own Number	Yes	Read only (add/edit/delete are not supported)
Voice Memo	Yes	
Call Reminder	No	
Network Selection	Automatic	
Mute	Yes	
Call Divert	Yes	
Call Barring	Yes	
Call Charge (AoC)	Yes	
Call Duration	Yes	
SMS (EMS)	There is no limitation on the number of items. It depends on available memory amount.	EMS does not support.
SMS Over GPRS	No	
EMS Melody / Picture	No	
Send / Receive / Save	No	
MMS MPEG4 Send / Receive / Save	Yes	
Long Message	MAX 459 characters	SMS 3pages
Cell Broadcast	Yes	
Download	Over the Web	
Game	Yes	
Calendar	Yes	
Memo	Yes	There is no limitation on the number of items. It depends on available memory amount.
World Clock	No	
Unit Convert	No	
Stop Watch	No	
Wall Paper	Yes	

WAP Browser	No	Support only web browser based on webkit. WAP stack and wml are not supported.
Download Melody / Wallpaper	Yes	Over web browser
SIM Lock	Yes	Operator Dependent
SIM Toolkit	Class 1, 2, 3, C	
MMS	Yes	Google MMS Client
EONS	Yes	
CPHS	Yes	V4.2
ENS	No	
Camera	Yes	5M AF / Digital Zoom : x4
JAVA	Yes	CLDC V1.1 / MIDP V2.1 Download Over Web
Voice Dial	No	
IrDa	No	
Bluetooth	Yes	Ver. 3.0 (HSP,HFP,A2DP,AVRCP)
FM radio	Yes	
GPRS	Yes	Class 12
EDGE	Yes	Class 12
Hold / Retrieve	Yes	
Conference Call	Yes	Max. 6
DTMF	Yes	
Memo pad	No	
TTY	No	
AMR	Yes	
SyncML	Yes	
IM	Yes	
Email	Yes	

2.6 HW SPEC.

1) GSM transceiver specification

Item	Specification
Phase Error	Rms : 5° Peak : 20 °
Frequency Error	GSM : 0.1 ppm DCS/PCS : 0.1 ppm
EMC(Radiated Spurious Emission Disturbance)	GSM/DCS : < -28dBm
Transmitter Output power and Burst Timing	GSM : 5dBm – 33dBm ± 3dB DCS/PCS : 0dBm – 30dBm ± 3dB
Burst Timing	<3.69us
Spectrum due to modulation out to less than 1800kHz offset	200kHz : -36dBm 600kHz : -51dBm/-56dBm
Spectrum due to modulation out to larger than 1800kHz offset to the edge of the transmit band	GSM : 1800-3000kHz :< -63dBc(-46dBm) 3000kHz-6000kHz : <-65dBc(-46dBm) 6000kHz < : < -71dBc(-46dBm) DCS : 1800-3000kHz :< -65dBc(-51dBm) 6000kHz < : < -73dBc(-51dBm)
Spectrum due to switching transient	400kHz : -19dBm/-22dBm(5/0), -23dBm 600kHz : -21dBm/-24dBm(5/0), -26dBm
Reference Sensitivity – TCH/FS	Class II(RBER) : -105dBm(2.439%)
Usable receiver input level range	0.012(-15 - -40dBm)
Intermodulation rejection – Speech channels	± 800kHz, ± 1600kHz : -98dBm/-96dBm (2.439%)
AM Suppression – GSM : -31dBm - DCS : -29dBm	-98dBm/-96dBm (2.439%)
Timing Advance	± 0.5T

2) WCDMA transmitter specification

Item	Specification
Transmit Frequency	Band1 : 1920 MHz ~ 1980 MHz Band8 : 880MHz ~ 915MHz
Maximum Output Power	+24 dBm / 3.84 MHz, +1 / -3 dB
Frequency Error	within ±0.1 PPM
Open Loop Power Control	Normal Conditions : within ±9 dB, Extreme Conditions : within ±12 dB
Minimum Transmit Power	< -50 dBm /3.84 MHz
Occupied Bandwidth	< 5 MHz at 3.84 Mcps (99% of power)
Adjacent Channel Leakage Power Ratio (ACLR)	> 33 dB @ ±5 MHz, > 43 dB @ ±10 MHz
Spurious Emissions |f-fc| > 12.5 MHz	< -36 dBm / 1 kHz RW @ 9 kHz ≤ f < 150 kHz < -36 dBm / 10 kHz RW @ 150 KHz ≤ f < 30 MHz < -36 dBm / 100 kHz RW @ 30 MHz ≤ f < 1 GHz < -30 dBm / 1 MHz RW @ 1 GHz ≤ f < 12.75 GHz < -60 dBm / 3.84 MHz RW @ 869 MHz ≤ f ≤ 894 MHz < -60 dBm / 3.84 MHz RW @ 1930 MHz ≤ f ≤ 1900 MHz < -60 dBm / 3.84 MHz RW @ 2110 MHz ≤ f ≤ 2155 MHz < -67 dBm / 100 kHz RW @ 925 MHz ≤ f ≤ 935 MHz < -79 dBm / 100 kHz RW @ 935 MHz < f ≤ 960 GHz < -71 dBm / 100 kHz RW @ 1805 MHz ≤ f ≤ 1880 MHz < -41 dBm / 300 kHz RW @ 1884.5 MHz < f < 1919.6 MHz
Transmit Intermodulation	< -31 dBc @ 5 MHz & < -41 dBc @ 10 MHz when Interference CW Signal Level = -40 dBc
Error Vector Magnitude	< 17.5 %, when Pout ≥ -20 dBm
Peak Code Domain Error	< -15 dB at Pout ≥ -20 dBm

3) WCDMA receiver specification

Item	Specification
Receive Frequency	Band1 : 2110 ~ 2170 MHz Band8 : 925~960MHz
Reference Sensitivity Level	Band1 : BER < 0.001 when Îor = -106.7 dBm / 3.84 MHz Band8 : BER < 0.001 when Îor = -103.7 dBm / 3.84 MHz
Maximum Input Level	BER < 0.001 when Îor = -25 dBm / 3.84 MHz
Adjacent Channel Selectivity (ACS)	ACS > 33 dB where BER < 0.001 when Îor = -92.7dBm / 3.84 MHz & Ioac = –52 dBm / 3.84 MHz @ ±5 MHz(Band1) Îor = -89.7dBm / 3.84 MHz & Ioac = –52 dBm / 3.84 MHz @ ±5 MHz(Band8)
Blocking Characteristic	BER < 0.001 when Îor = -103.7 dBm / 3.84 MHz & Iblocking = -56 dBm / 3.84 MHz @ Fuw(offset) = ±10 MHz or Iblocking = -44 dBm / 3.84 MHz @ Fuw(offset) = ±15 MHz
Spurious Response	BER < 0.001 when Îor = -103.7 dBm / 3.84 MHz & Iblocking = -44 dBm
Intermodulation	BER < 0.001 when Îor= -103.7 dBm / 3.84 MHz, Îor = -100.7 dBm/ 3.84 MHz(Band8) & Iouw1 = -46 dBm @ Fuw1(offset) = ±10 MHz & Iouw2 = -46 dBm / 3.84 MHz @ Fuw2(offset) = ±20 MHz
Spurious Emissions	< -57 dBm / 100 kHz BW @ 9 kHz ≤ f < 1 GHz < -47 dBm / 1 MHz BW @ 1 GHz ≤ f ≤ 12.75 GHz
Inner Loop Power Control In Uplink	Adjust output(TPC command) cmd 1dB 2dB 3dB +1 +0.5/1.5 +1/3 +1.5/4 0 -0.5/+0.5 -0.5/+0.5 -0.5/+0.5 -1 -0.5/-1.5 -1/-3 -1.5/-4 group(10equal command group) +1 +8/+12 +16/+24

4) HSDPA transmitter specification

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Transmit Frequency</td><td>Band1 : 1920 MHz ~ 1980 MHz
Band8 : 880MHz ~ 915MHz</td></tr>
<tr><td>Maximum Output Power</td><td>Sub-Test
1=1/15, 2=12/15 21~25dBm / 3.84 MHz
3=13/15 4=15/8 20~25dBm / 3.84 MHz
5=15/7 6=15/0 19~25dBm / 3.84 MHz</td></tr>
<tr><td>HS-DPCCH</td><td>
<table>
<tr><th>Sub-test in table C.10.1.4</th><th>Power step</th><th>Power step slot boundary</th><th>Power step size, P [dB]</th><th>Transmitter power step tolerance [dB]</th></tr>
<tr><td rowspan="4">5</td><td>1</td><td>Start of Ack/Nack</td><td>6</td><td>+/- 2.3</td></tr>
<tr><td>2</td><td>Start of CQI</td><td>1</td><td>+/- 0.6</td></tr>
<tr><td>3</td><td>Middle of CQI</td><td>0</td><td>+/- 0.6</td></tr>
<tr><td>4</td><td>End of CQI</td><td>5</td><td>+/- 2.3</td></tr>
</table>
</td></tr>
<tr><td>Spectrum Emission Mask</td><td>Sub-Test : 1=1/15, 2=12/15, 3=13/15, 4=15/8, 5=15/7, 6=15/0
<table>
<tr><th>Frequency offset from carrier △f</th><th>Minimum requirement</th><th>Measurement Bandwidth</th></tr>
<tr><td>2.5 ~ 3.5 MHz</td><td>-35-15×(△f-2.5)dBc</td><td>30 kHz</td></tr>
<tr><td>3.5 ~ 7.5 MHz</td><td>-35-1×(△f-3.5)dBc</td><td>1 MHz</td></tr>
<tr><td>7.5 ~ 8.5 MHz</td><td>-35-10×(△f-7.5)dBc</td><td>1 MHz</td></tr>
<tr><td>8.5 ~ 12.5 MHz</td><td>-49dBc</td><td>1 MHz</td></tr>
</table>
</td></tr>
<tr><td>Adjacent Channel Leakage Power Ratio (ACLR)</td><td>Sub-Test : 1=1/15, 2=12/15, 3=13/15, 4=15/8, 5=15/7, 6=15/0
> 33 dB @ ±5 MHz
> 43 dB @ ±10 MHz</td></tr>
<tr><td>Error Vector Magnitude</td><td>< 17.5 %, when Pout ≥ -20 dBm</td></tr>
</table>

5) HSDPA receiver specification

Item	Specification
Receive Frequency	Band1 : 2110 MHz ~ 2170 MHz Band8 : 925 MHz ~ 960 MHz
Maximum Input Level (BLER or R), 16QAM Only	Sub-Test : 1=1/15, 2=12/15, 3=13/15, 4=15/8, 5=15/7, 6=15/0 BLER < 10% or R >= 700kbps

6) WLAN 802.11b transceiver specification

Item	Specification
Transmit Frequency	2400 MHz ~ 2483.5 MHz (CH1~CH13)
Tx Power Level	≤ 20dBm under (Europe), ≤ 30dBm under (USA)
Frequency Tolerance	within ±25 PPM
Chip clock Frequency Tolerance	within ±25 PPM
Spectrum Mask	≤ -30 @ fc-22MHz< f <fc-11MHz and fc+11MHz< f <fc+22MHz ≤ -50 @ f < fc-22MHz and f > fc+22MHz
Power ramp on/off time	≤ 2us
Carrier Suppression	≤ -15dB
Modulation Accuracy (Peak EVM)	≤ 35%
Spurious Emissions	< -36 dBm @ 30MHz ~ 1GHz < -30 dBm above @ 1GHz ~ 12.75GHz < -47 dBm @ 1.8GHz ~ 1.9GHz < -47 dBm @ 5.15GHz ~ 5.3GHz
Rx Min input Sensitivity	≤ -76dBm(1Mbps,2Mbps,5.5Mbps,11Mbps) @ FER ≤ 8%
Rx Max input Sensitivity	≥ -10dBm(1Mbps,2Mbps,5.5Mbps,11Mbps) @ FER ≤ 8%
Rx Adjacent Channel Rejection	≥ 35dB @FER ≤ 8%, interference input signal -70dBm@fc±25MHz(11Mbps)

7) WLAN 802.11g transceiver specification

Item	Specification
Transmit Frequency	2400 MHz ~ 2483.5 MHz (CH1~CH13)
Tx Power Level	≤ 20dBm under (Europe), ≤ 30dBm under (USA)
Frequency Tolerance	within ±25 PPM
Chip clock Frequency Tolerance	within ±25 PPM
Spectrum Mask	≤ -20 @ ±11MHz offset (9Mhz ~ 11MHz) ≤ -28 @ ±20MHz offset (11MHz ~ 20Mhz) ≤ -40 @ ±30MHz offset (20MHz ~ 30Mhz)
Transmitter constellation error (rms EVM)	≤ -5dB
Spurious Emissions	< -36 dBm @ 30MHz ~ 1GHz < -30 dBm above @ 1GHz ~ 12.75GHz < -47 dBm @ 1.8GHz ~ 1.9GHz < -47 dBm @ 5.15GHz ~ 5.3GHz
Rx Min input Sensitivity	PER ≤ 10% -82dBm@6Mbps, -81dBm@9Mbps, -79dBm@12Mbps -77dBm@18Mbps, -74dBm@24Mbps, -70dBm@36Mbps -66dBm@48Mbps, -65dBm@54Mbps
Rx Max input Sensitivity	≥ -20dBm(6,9,12,18,24,36,48,54Mbps) @ PER ≤ 10%
Rx Adjacent Channel Rejection	PER ≤ 10%, ACR ≥ 16dB@6Mbps, ACR ≥ 15dB@9Mbps, ACR ≥ 13dB@12Mbps, ACR ≥ 11dB@18Mbps, ACR ≥ 8dB@24Mbps, ACR ≥ 4dB@36Mbps ACR ≥ 0dB@48Mbps, ACR ≥ -1dB@54Mbps ※ACR shall be measured by setting the desired signal's strength 3 dB above the rate-dependent sensitivity specified in min input sensitivity

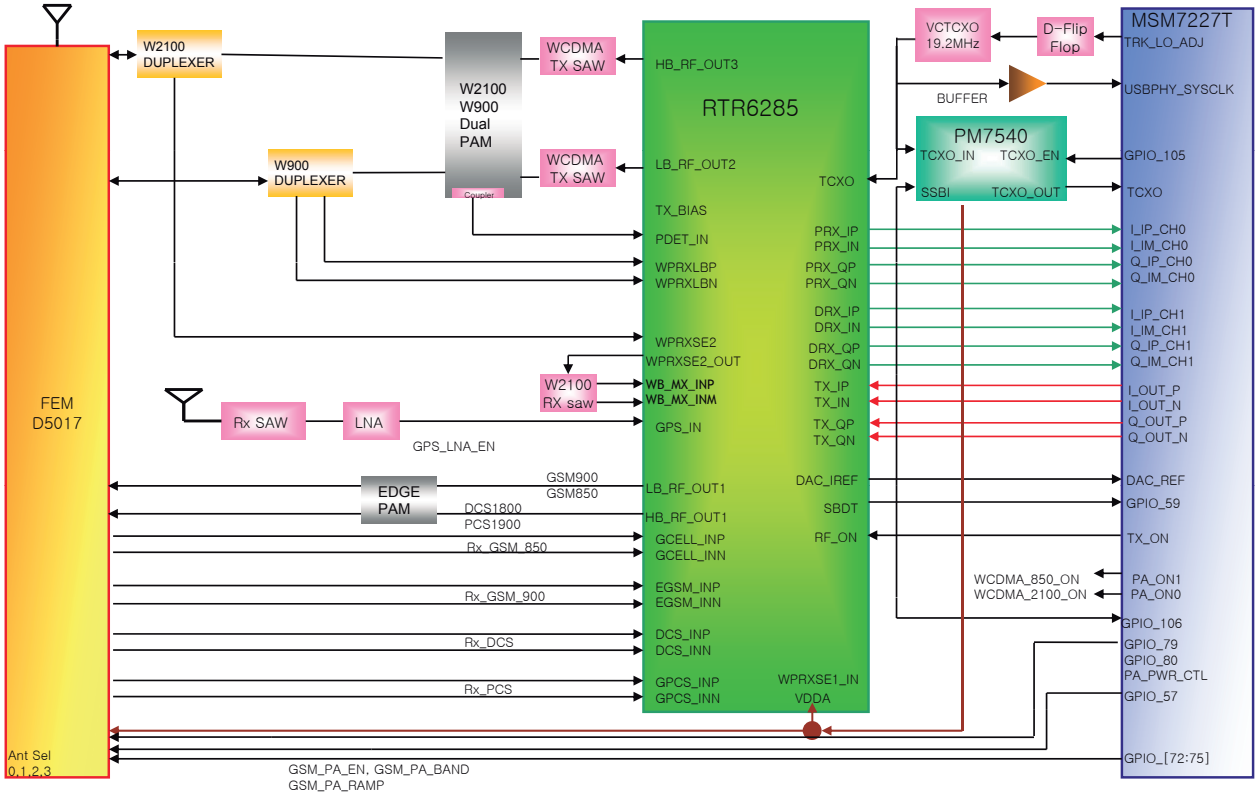
8) GPS receiver specification

Item	Specification
Receive Frequency	1574.42 MHz ~ 1576.42 MHz
Minimum Sensitivity	1 satellite ≥-142dBm, 7 satellites ≥ -147dBm at coarse time aiding

3. TECHNICAL BRIEF

3.1 GENERAL DESCRIPTION

The E510 supports UMTS-900, UMTS-2100, GSM-850, GSM-850, GSM-900, GSM-1800, and GSM-1900 based GSM/GPRS/EDGE/UMTS. All receivers and the UMTS transmitter use the radioOne1 Zero-IF architecture to eliminate intermediate frequencies, directly converting signals between RF and baseband. The quad-band GSM transmitters use a baseband-to-IF upconversion followed by an offset phase-locked loop that translates the GMSK-modulated or 8-PSK-modulated signal to RF.



[Figure 1-1] Block diagram of RF part

A generic, high-level functional block diagram of E510 is shown in Figure 1-1. One antenna collects base station forward link signals and radiates handset reverse link signals. The antenna connects with receive and transmit paths through a FSM(Front-End-Module).

The UMTS receive paths each include an LNA, an RF band-pass filter, and a downconverter that translate the signal directly from RF-to-baseband using radioOne ZIF techniques. The RFIC's Rx analog baseband outputs, for the receive chains, connect to the MSM IC. The UMTS and GSM Rx baseband outputs share the same inputs to the MSM IC.

For the transmit chains, the RTR6285 IC directly translates the Tx baseband signals (from the MSM device) to an RF signal using an internal LO generated by integrated onchip PLL and VCO. The RTR6285 IC outputs deliver fairly high-level RF signals that are first filtered by Tx SAWs and then amplified by their respective UMTS PAs. In the GSM receive path, the received RF signals are applied through their band-pass filters and down-converted directly to baseband in the RTR6285 transceiver IC. These baseband outputs are shared with the UMTS receiver and routed to the MSM IC for further signal processing.

The GSM/EDGE transmit path employs one stage of up-conversion and, in order to improve efficiency, is divided into phase and amplitude components to produce an open-loop Polar topology:

1. The on-chip quadrature up-converter translates the GMSK-modulated signal or 8-PSK modulated signal, to a constant envelope phase signal at RF;

2. The amplitude-modulated (AM) component is applied to the ramping control pin of Polar power amplifier from a DAC within the MSM. E510 power supply voltages are managed and regulated by the PM7540 Power Management IC. This versatile device integrates all wireless handset power management, general housekeeping, and user interface support functions into a single mixed signal IC.

It monitors and controls the external power source and coordinates battery recharging while maintaining the handset supply voltages using low dropout, programmable regulators.

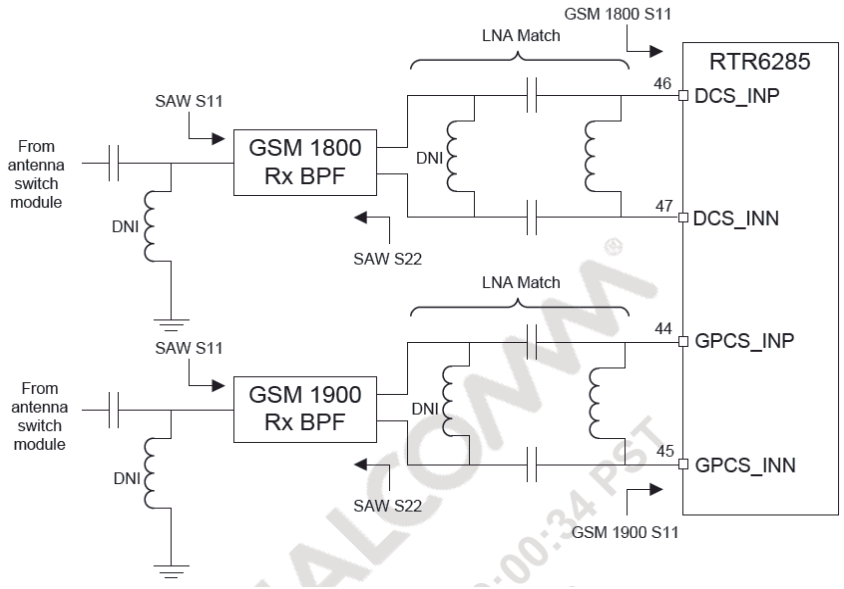
The device's general housekeeping functions include an ADC and analog multiplexer circuit for monitoring on-chip voltage sources, charging status, and current flow, as well as user-defined off-chip variables such as temperature, RF output power, and battery ID.

Various oscillator, clock, and counter circuits support IC and higher-level handset functions. Key parameters such as under-voltage lockout and crystal oscillator signal presence are monitored to protect against detrimental conditions.

3.2 GSM MODE

3.2.1 GSM RECEIVER

The GSM-850, GSM-900, GSM-1800, and GSM-1900 receiver inputs of RTR6285 are connected directly to the transceiver front-end Module. GSM-850, GSM-900, GSM-1800, and GSM-1900 receiver inputs use differential configurations to improve common-mode rejection and second-order non-linearity performance. For example Figure 1-2 shows receiver input topologies for DCS and PCS (GSM-850/900 have the same receiver input topologies). The balance between the complementary signals is critical and must be maintained from the RF filter outputs all the way into the IC pins.



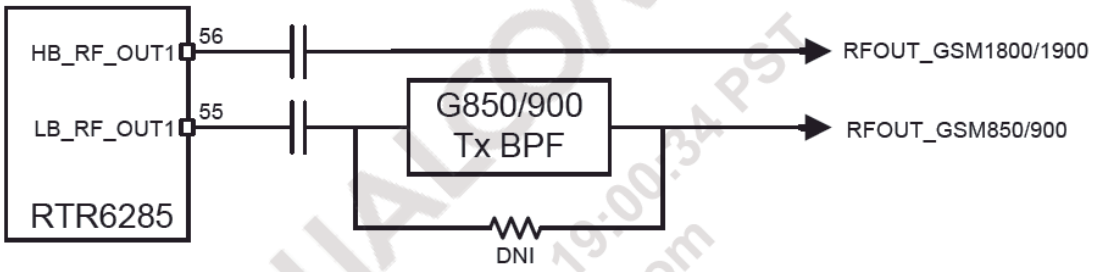
[Figure 1-2] DCS and PCS Receiver Inputs Topologies

Since GSM-850, GSM-900, GSM-1800, and GSM-1900 signals are time-division duplex (the handset can only receive or transmit at one time), switches are used to separate Rx and Tx signals in place of frequency duplexers – this is accomplished in the switch module. The GSM-850, GSM-900, GSM-1800, and GSM-1900 receive signals are routed to the RTR6285 through band selection filters and matching networks that transform single-ended 50-Ω sources to differential impedances optimized for gain and noise figure. The RTR input uses a differential configuration to improve second-order intermodulation and common mode rejection performance. The RTR6285 input stages include MSM-controlled gain adjustments that maximize receiver dynamic range.

The amplifier outputs drive the RF ports of the quadrature RF-to-baseband downconverters. The downconverted baseband outputs are multiplexed and routed to lowpass filters (one I and one Q) having passband and stopband characteristics suitable for GMSK or 8-PSK processing. These filter circuits include DC offset corrections. The filter outputs are buffered and passed on to the MSM7227T IC for further processing asshown in Figure 1-2.

3.2.2 GSM TRANSMITTER

The RTR6285 transmitter outputs(HB_RF_OUT1 and LB_RF_OUT1) include on-chip output matching inductors. 50ohm output impedance is achieved by adding a series capacitor at the output pins. The capacitor value may be optimized for specific applications and PCB characteristics based on pass-band symmetry about the band center frequency as shown in Figure 1-3.



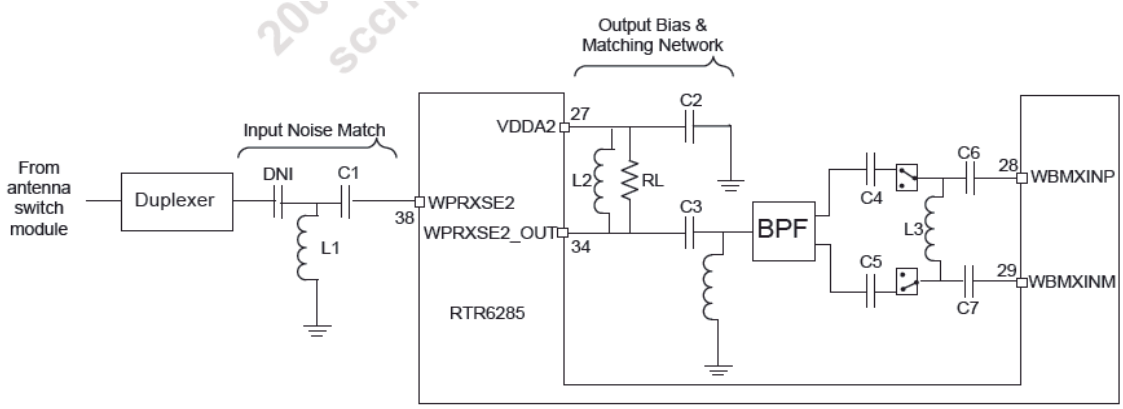
[Figure 1-3] GSM Transmitter Outputs Topologies

The RTR6285 IC is able to support GSM 850/900 and GSM 1800/1900 mode transmitting. This design guideline shows a tri-band GSM application. Both high-band and low band outputs are followed by resistive pads to ensure that the load presented to the outputs remains close to 50ohm.

3.3 UMTS MODE

3.3.1 UMTS RECEIVER

The UMTS duplexer receiver output is routed to LNA circuits within the RTR6285 device as shown in Figure 1-4. The UMTS Rx input is provided with an on-chip LNA that amplifies the signal before a second stage filter that provides differential downconverter as shown in Figure 1-5. This second stage input is configured differentially to optimize secondorder intermodulation and common mode rejection performance. The gain of the UMTS frontend amplifier and the UMTS second stage differential amplifier are adjustable, under MSM control, to extend the dynamic range of the receivers. The second stage UMTS Rx amplifiers drive the RF ports of the quadrature RF-to-baseband downconverters. The downconverted UMTS Rx baseband outputs are routed to lowpass filters having passband and stopband characteristics suitable for UMTS Rx processing. These filter circuits allow DC offset corrections, and their differential outputs are buffered to interface shared with GSM Rx to the MSM IC. The UMTS baseband outputs are turned off when the RTR6285 is downconverting GSM signals and on when the UMTS is operating.



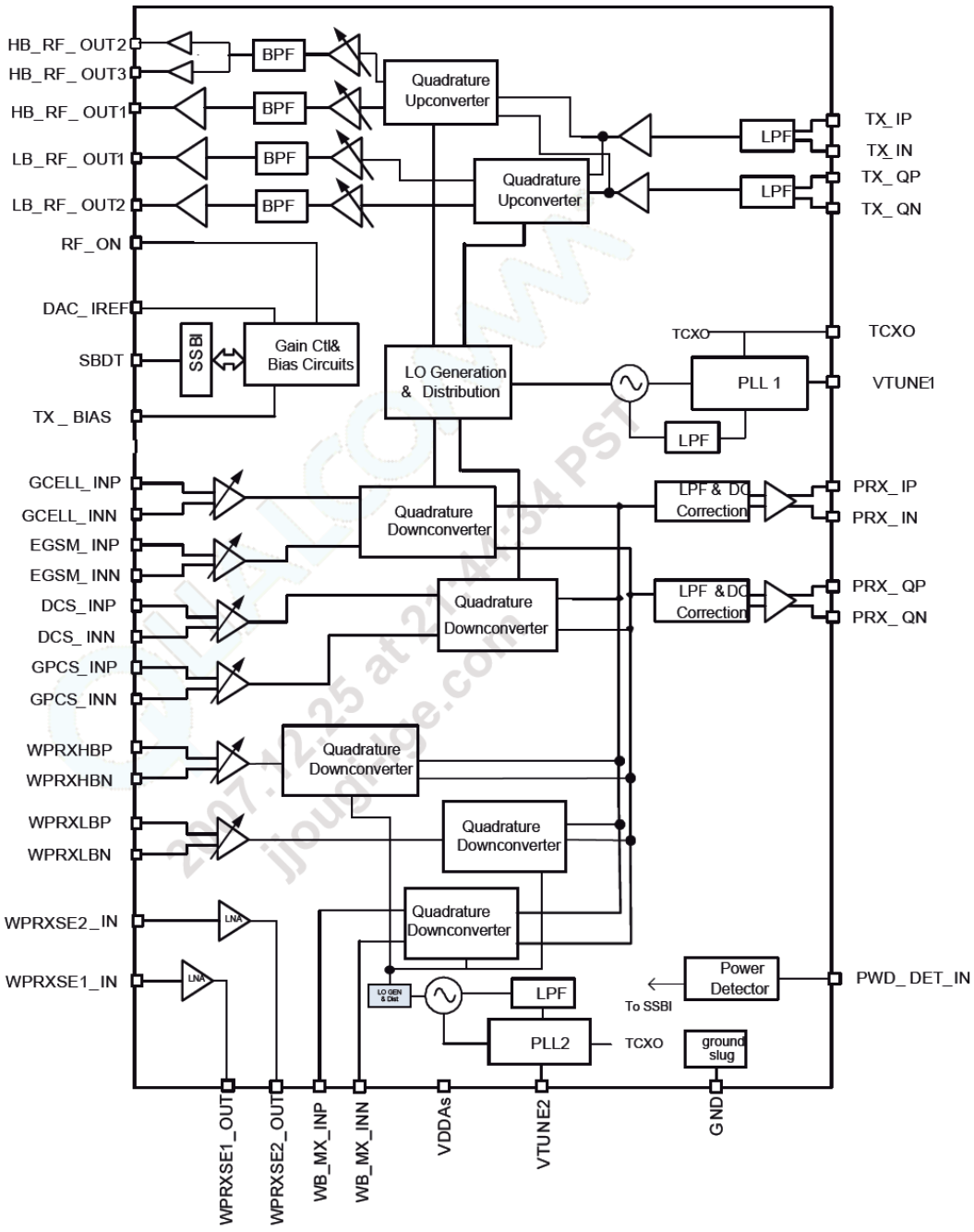
[Figure 1-4] UMTS Receiver Inputs Topologies

3.3.2 UMTS TRANSMITTER

The UMTS Tx path begins with differential baseband signals (I and Q) from the MSM device. These analog input signals are amplified, filtered, and applied to the quadrature up-converter mixers. The up-converter output is amplified by multiple variable gain stages that provide transmit AGC control. The AGC output is filtered and applied to the driver amplifier; this output stage includes an integrated matching inductor that simplifies the external matching network to a single series capacitor to achieve the desired 50-Ω interface.

The RTR6285 UMTS output is routed to its power amplifier through a bandpass filter, and delivers fairly high-level signals that are filtered and applied to the PA. Transmit power is delivered from the duplexer to the antenna through the switch module. The transceiver LO synthesizer is contained within the RTR6285 IC with the exception of the off-chip loop filter components and the VC-TCXO. This provides a simplified design for multimode applications. The PLL circuits include a reference divider, phase detector, charge pump, feedback divider, and digital logic generator.

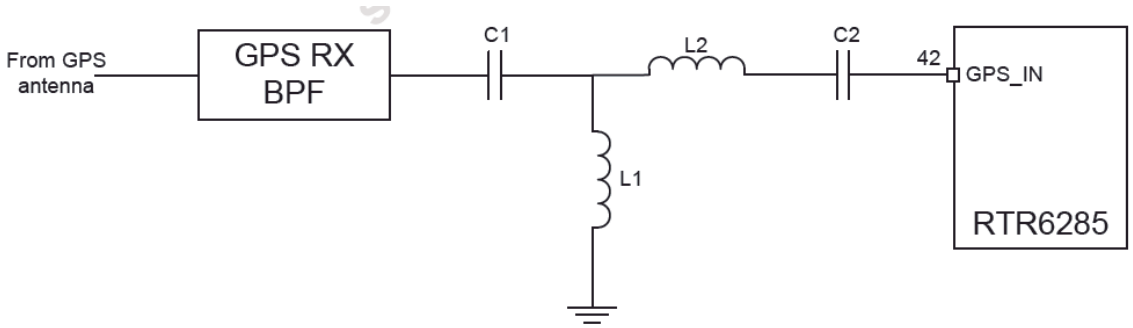
UMTS Tx. Using only PLL1, the LO generation and distribution circuits create the necessary LO signals for nine different frequency converters. The UMTS transmitter also employs the ZIF architecture to translate the signal directly from baseband to RF. This requires FLO to equal FRF, and the RTR6285 IC design achieves this without allowing FVCO to equal FRF. The RTR6285 IC is able to support UMTS 2100/1900/1800/1700 and 850 mode transmitting. This design guideline shows only UMTS 2100 applications.



[Figure 1-5] RTR6285 IC Functional Block Diagram

3.4 GPS RECEIVER

The GPS receiver input employs a single-ended connection realized by this pin. The GPS input is routed from the GPS antenna switch, through a band pass filter and then an impedance transformer circuit that optimally matches the impedance looking into the GPS LNA. The impedance transformer circuit topology is shown in Figure 1-6.



[Figure 1.6] GPS Input Network Topology

3.5 LO GENERATION and DISTRIBUTION CIRCUIT

The integrated LO generation and distribution circuits are driven by internal VCOs to support various modes to yield highly flexible quadrature LO outputs that drive all GSM/EDGE, UMTS band and GPS up-converters and down-converters; with the help of these LO generation and distribution circuits, true zero-IF architecture is employed in all GSM and UMTS band receivers and transmitters to translate the signal directly from RFto-baseband and from baseband-to-RF. Two fully functional fraction-N synthesizers, including VCOs and loop filters, are integrated within the RTR6285 IC. In addition, the RTR6285 has a third synthesizer used for GPS operation. The first synthesizer (PLL1) in the RTR6285 creates the transceiver Los that support the UMTS transmitter, and all four GSM band receivers and transmitters including: GSM850, GSM900, GSM1800, and GSM1900. The second synthesizer (PLL2) in the RTR6285 IC provides the LO for the UMTS primary receiver. For the RTR6285 IC only, the second synthesizer also provides the LO for the secondary UMTS receiver. The third synthesizer (PLL3), only in the RTR6285 IC, provides the LO for the GPS receiver. An external TCXO input signal is required to provide the synthesizer frequency reference to which the PLL is phase and frequency locked. The RTR6285 ICs integrate most of the PLL loop filter components on-chip except for three off-chip loop filter-series capacitors, which significantly reduces off-chip component requirement. With the integrated fractional-N PLL synthesizers, the RTR6285 ICs have the advantage of more flexible loop bandwidth control, fast lock time, and low-integrated phase error.

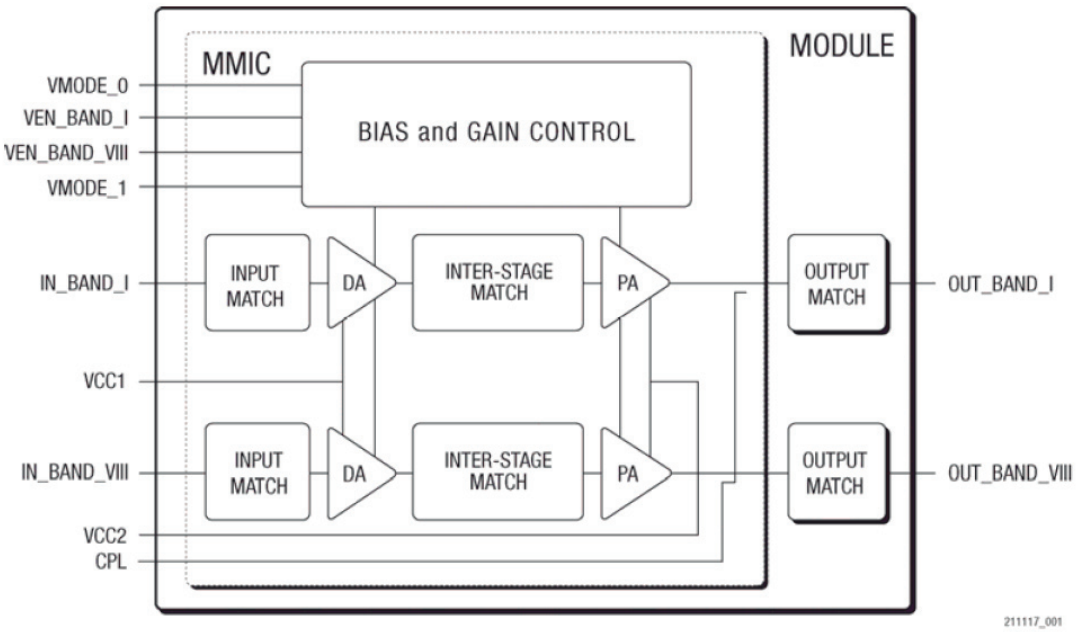
3.6 OFF-CHIP RF COMPONENTS

3.6.2. UMTS PAM (U1002, SKY77195)

The SKY77195 Power Amplifier Module (PAM) is a fully matched, 14-pad, surface mount module developed for Wideband Code Division Multiple Access (WCDMA) applications. This small and efficient module packs full WCDMA Band I and Band VIII coverage into a single compact package. The SKY77195 meets the stringent spectral linearity requirements of WCDMA transmission, with high power added efficiency for power output to 27.5 dBm (Band I) and 28 dBm (Band VIII). The SKY77195 meets the stringent spectral linearity requirements of High Speed Downlink Packet Access (HSDPA)

data transmission with high power added efficiency. A directional coupler is integrated into the module thus eliminating the need for any external coupler.

The single Gallium Arsenide (GaAs) Microwave Monolithic Integrated Circuit (MMIC) contains all active circuitry in the module. The MMIC contains on-board bias circuitry, as well as input and interstage matching circuits. Output match into a 50-ohm load is realized off-chip within the module package to optimize efficiency and power performance



SKY77195 (W2100,W900)

3.6.2 19.2MHz VCTCXO (X210, X1G003581002700)

The Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO) provides the reference frequency for all RFIC synthesizers as well as clock generation functions within the MSM7227T IC. The oscillator frequency is controlled by the MSM7227T ICs.

TRK_LO_ADJ pulse density modulated signal in the same manner as the transmit gain control TX_AGC_ADJ. A two-pole RC lowpass filter is recommended on this control line.

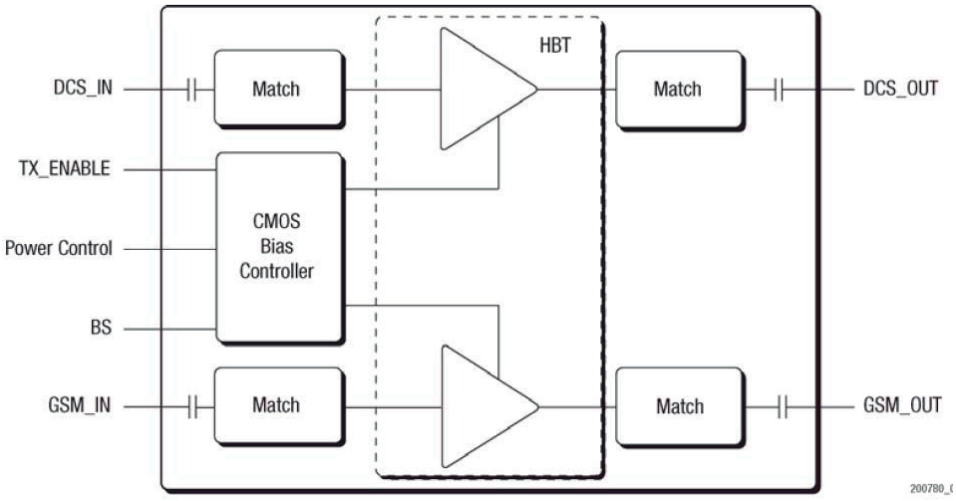
The PM7540 IC controls the handset power-up sequence, including a special VCTCXO warm-up interval before other circuits are turned on. This warm-up interval (as well as other TCXO controller functions) is enabled by the MSM TCXO_EN line . The PM7540 IC VREG_TCXO regulated output voltage is used to power the VCTCXO and is enabled before most other regulated outputs. Any GSM mode power control circuits within the MSM7227T IC require a reference voltage for proper operation and sufficient accuracy. Connecting the PM7540 IC REF_OUT directly to the MSM7227T IC GSM_PA_PWR_CTL_REF provides this reference. This sensitive analog signal needs a 0.1 µF low frequency filter near to MSM side, and isolate from digital logic and clock traces with ground on both sides, plus ground above and below if routed on internal layers.

3.6.3 GSM PAM (U1001, SKY77336)

SKY77336 Power Amplifier Module (PAM) is designed in a compact form factor for quad-band cellular handsets comprising GSM850/900, DCS1800 and PCS1900, supporting Gaussian Minimum-Shift Keying (GMSK) and Polar Enhanced Data for GSM Evolution (EDGE) modulation. Class 12 General Packet Radio Service (GPRS) multi-slot operation is also supported.

The module consists of GSM850/900 PA and DCS1800/PCS1900 PA blocks, impedance matching circuitry for 50 Ù input and output impedances, and a Power Amplifier Control (PAC) block. The custom CMOS integrated circuit provides the internal PAC function and interface circuitry. Fabricated in InGaP/GaAs, the Heterojunction Bipolar Transistor (HBT) PA blocks support the GSM850/900 bands and DCS1800/PCS1900 bands. Both PA blocks share common power supply pads to distribute current. The InGaP/GaAs die, Silicon (Si) controller die, and passive components are mounted on a multi-layer laminate substrate and the entire assembly is encapsulated with plastic overmold.

RF input and output ports of the SKY77336 are internally matched to a 50 Ù load to reduce the number of external components for a quad-band design. Extremely low leakage current (10 ìA, typical) of the PAM module maximizes handset standby time.



[Figure 1.9] SKY77336 Block Diagram

3.6.4 GPS LNA (U1003, ALM-2412)

Avago Technologies' ALM-2412-SG1G is a LNA with integrated filter designed for GPS band applications at 1.575GHz. The LNA uses Avago Technologies' proprietary GaAs Enhancement-mode pHEMT process to achieve high gain operation with very low noise figures and high linearity. Noise figure distribution is very tightly controlled. Gain and supply current are guaranteed parameters. A CMOS compatible shutdown pin is included to turn the LNA off and provide a variable bias. The integrated filter utilizes an Avago Technologies' leading-edge FBAR filter for exceptional rejection at Cell/PCS-Band frequencies.
The ALM-2412-SG1G is useable down to 1V operation. It achieves low noise figures and high gain even at 1V, making it suitable for use in critical low-power GPS applications.
The module is housed in a cost effective, small and thin package (3.3x2.1x1.1mm3).
This part is MSL Class 3 and HBM ESD Level Class 1A.

3.6.5 FEM (FL1000, D5017)

Low-loss SAW frontend module for mobile telephone system

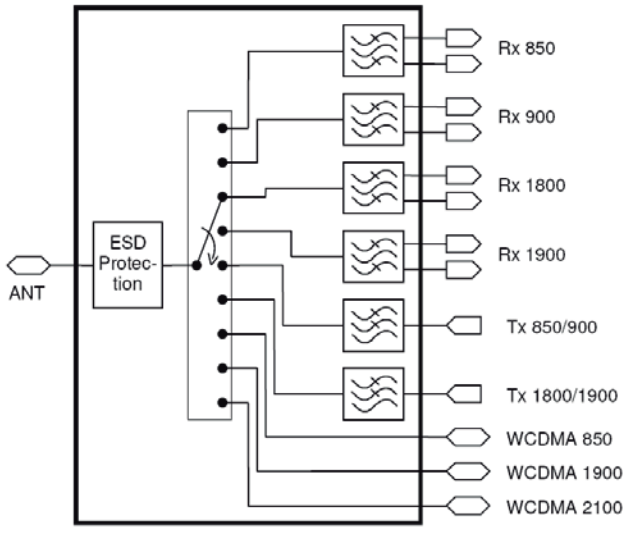
Covering GSM850, GSM900, GSM1800, GSM1900, WCDMA Triple bands

Integration of TX low pass filters, switches and decoder

Integration of GSM 850, EGSM, PCN and PCS RX SAWs

Balanced outputs of all RX ports

Integration of ESD protection at Ant port to 8kV, acc. IEC-61000-4-2 (contact discharge)



Control Logic

	CTRL 1	CTRL 2	CTRL 3	CTRL 4
GSM850 / EGSM TX	1	1	0	0
PCN / PCS TX	1	0	0	0
WB850	0	1	0	1
WB1900	0	0	0	1
WB2100	0	0	1	1
GSM850 RX	0	1	1	0
EGSM RX	0	0	1	0
PCN RX	0	1	0	0
PCS RX	0	0	0	0

[Figure 1.10] D5017 Block Diagram & control logic

3.7 Digital Baseband(DBB/MSM7227T)

3.7.1 General Description

A. Features(MSM7227T)

The basic MSM7227T system solution consists of the MSM7227T, RTR6285™, and PM7540™ ICs, plus AMSS™ system software with the SURF7227™ platform available for development. General features include:

-WCDMA Rel '99 plus HSDPA and HSUPA

-GSM/GPRS/EDGE

-High-performance ARM1136JF-S™ application processor at up to 600 MHz; QDSP5000™ at 320 MHz

-High-performance ARM926EJ-S™ modem processor at up to 400 MHz; QDSP4000™ at 122.88 MHz

-Java® hardware acceleration for faster Java-based games and other applets

-Support for Bluetooth® 2.1 EDR via an external Bluetooth System-on-Chip (SoC)

-High-speed, serial mobile display digital interface (MDDI) that optimizes the interconnection cost between the MSM device and the LCD panel

-Receive diversity support for WCDMA mode, thereby providing improved capacity and data throughput

-USB 2.0 compliant high-speed USB core with limited OTG capabilities

-Integrated high-speed USB PHY

-Integrated wideband stereo codec for digital audio applications

-Direct interface to digital camera module with video front-end (VFE) image processing

-GPS position location capabilities

-Vocoder support (GSM-HR, FR, EFR, AMR, and AMR-WB/+)

-Advanced 12 × 12 ×1.05 mm, 0.4 mm pitch, 560 NSP

3.8 Hardware Architecture

<System HW Block>

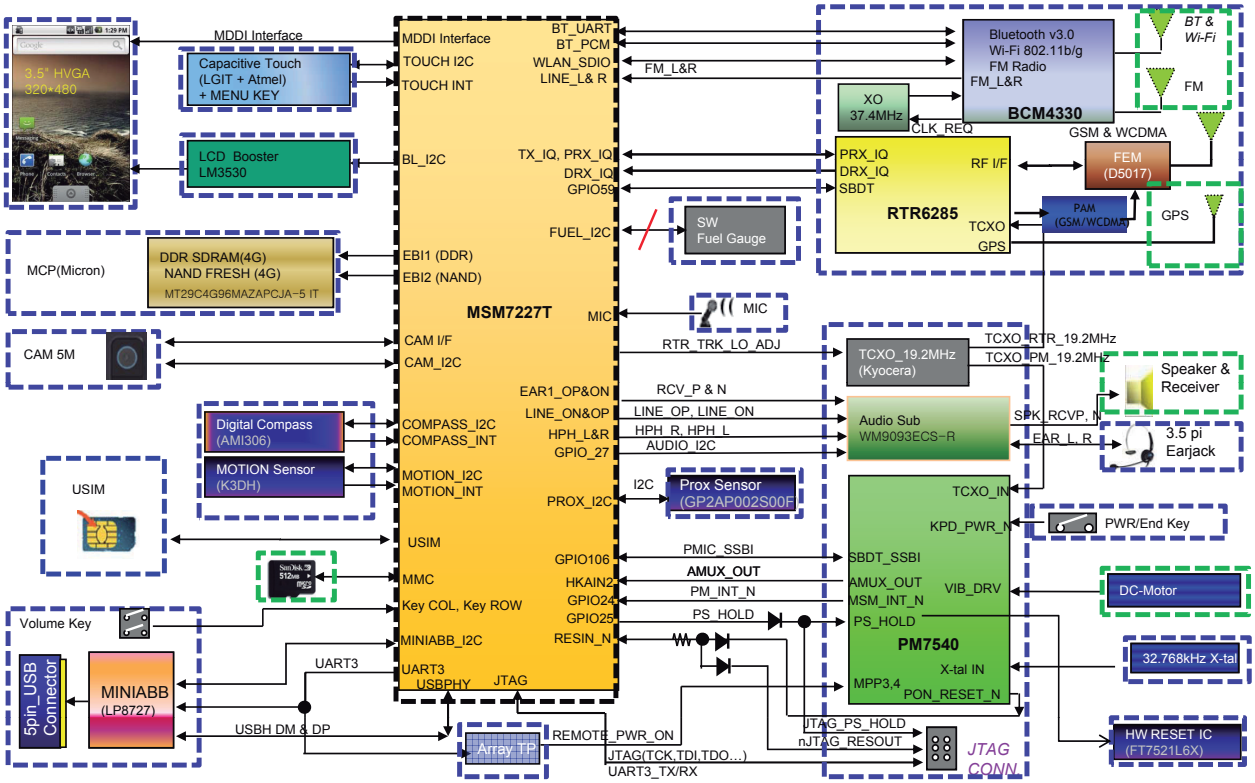


Figure. Block Diagram

<Power Block>

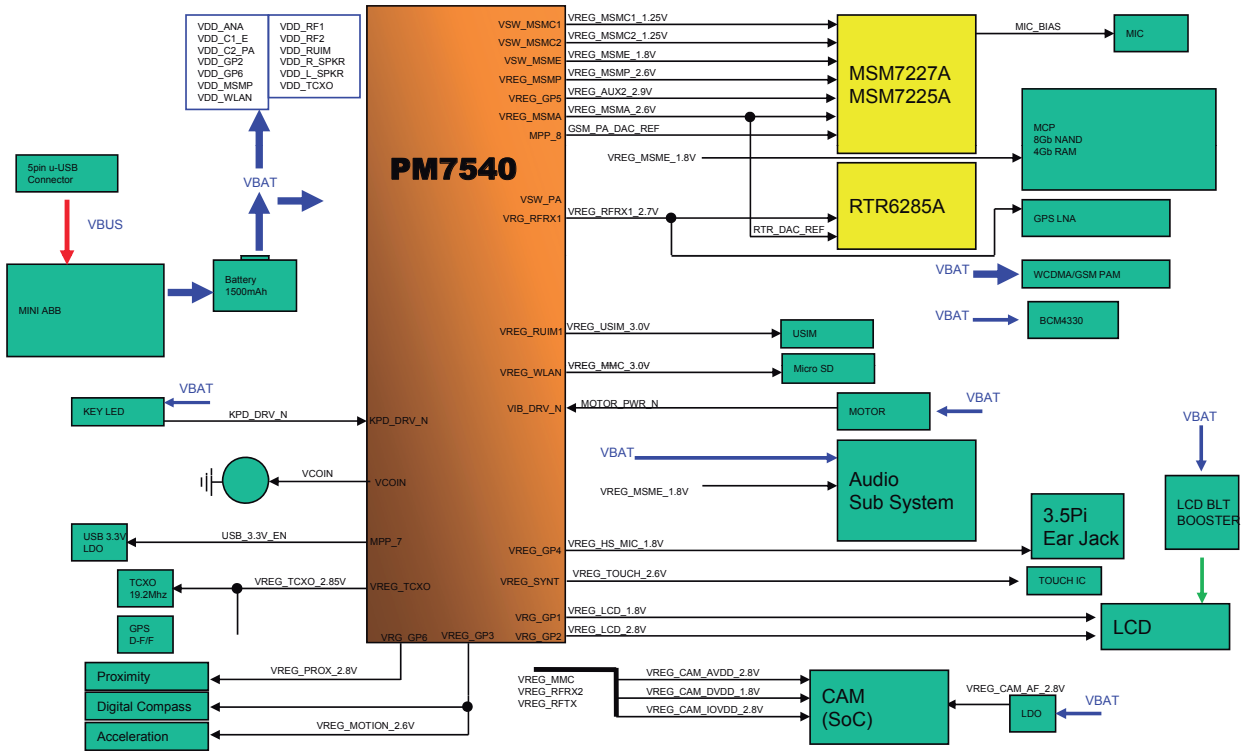


Figure. Simplified Block Diagram

3.9 Subsystem (MSM7227T)

3.9.1. ARM Microprocessor Subsystem

The MSM7227T device uses an embedded ARM1136JF-S, ARM926EJ-S microprocessor. This microprocessor, through the system software, controls most of the functionality for the MSM, including control of the external peripherals such as the keypad, LCD, SDRAM, and NANDFlash devices. Through a QUALCOMM proprietary single-wire SBI (SSBI) the ARM926EJ-S configures and controls the functionality of the RTR6285 and PM7540 devices.

3.9.2. WCDMA Subsystem

The WCDMA subsystem performs the data conversions and signal processing necessary to maintain the WCDMA air interface between the handset and the base station (and also the WCDMA network). The subsystem components include:

-Searcher engine

-Demodulating fingers

-Combining block

-Frame deinterleaver

-Viterbi decoder

-Reverse link subsystem

-Turbo decoder

On the forward link traffic channel, the WCDMA subsystem searches, demodulates, and decodes incoming pilot, sync, paging, and traffic channel information. It extracts low bit-rate packet data from the forward link traffic channel and sends the packet data to the vocoder for processing. On the reverse link, the WCDMA subsystem processes the packet data from the vocoder and modulates the reverse traffic channel.

3.9.3. GSM Subsystem

The GSM subsystem performs the data conversions and signal processing necessary to maintain the GSM air interface, including PA gain control for GPRS support. For GSM, the power profile ramps up before the burst and ramps down afterward. For GPRS, transmit bursts can occur in as many as four sequential slots and the PA must be ramped up and down smoothly between each slot, holding the desired output power level during each burst. GSM support includes:

-GSM release '99 (circuit switching)

-GPRS (packet switching)

-EDGE E2 power class for 8 PSK

3.9.4. RF Interface

The RF interface communicates with the mobile station's external RF and analog baseband circuits. Signals to these circuits control signal gain in the Rx and Tx signal path and maintain The system's frequency reference.

3.9.5. Single-wire serial bus interface (SSBI)

The MSM7227T device's SSBI is designed specifically to be a quick, low pin count control protocol for QUALCOMM's RTR6285 and PM7540 ASICs. Using the SSBI, the RTR6285 and PM7540 devices can be configured for different operating modes and for minimum power consumption, extending battery life in Standby mode. The SBI also controls DC baseband offset errors.

3.9.6. Audio function

MSM7227T audio functions include the analog Rx and Tx paths (or stereo wideband codec), audio digital signal processing (DSP) that provides adjustable gains and filtering, PCM circuits for interfacing with external devices, and additional audio DSP that actually implements encoding and decoding. Other key features include:

-The wideband codec supports stereo music/ringer melody applications in addition to the 8 kHz voice band applications on the forward link.

-A PCM interface allows an external codec to be used instead of the internal codec; this supports inter-IC Sound (I2S) modes that allow an external stereo DAC or SADC to be used.

-Currently in AMSS baseline only I2S output mode is supported (SDAC-only, no SADC support).

-Audio decoder summing and headset switch detection are included.

-Audio DSP includes the Rx and Tx filters needed to meet ITU-T G.712 requirements.

-A programmable sidetone path provides for summing part of the Tx audio into the Rx path.

-Many codec parameters are configurable via SBI registers.

-The audio processing is configured through QDSP5 command types and is not directly controlled by the microprocessor.

3.9.7. Vocoder Subsystem

The MSM7227T device's QDSP4000 supports AMR,FR,EFR and HR. In addition, the QDSP4000 has modules to support the following audio functions: DTMF tone generation, DTMF tone detection, Tx/Rx volume controls, Tx/Rx automatic gain control (AGC), Rx Automatic Volume Control (AVC), EarSeal Echo Canceller (ESEC), Acoustic Echo Canceller (AEC), Noise Suppression (NS), and programmable, 13-tap, Type-I, FIR, Tx/Rx compensation filters. The MSM7227T device's integrated ARM9TDMI processor downloads the firmware into the QDSP4000 and configures QDSP4000 to support the desired functionality.

3.9.8. Mode Select and JTAG Interfaces

The mode pins to the MSM7227T device determine the overall operating mode of the ASIC. The options under the control of the mode inputs are Native mode, which is the normal subscriber unit operation, ETM mode, which enables the built-in trace mode, and test mode for factory testing. The MSM7227T device meets the intent of the ANSI/IEEE 1149.1A-1993 feature list. The JTAG interface can be used to test digital interconnects between devices within the mobile station during manufacture.

3.9.9. General-Purpose Input/Output Interface

The MSM7227T IC includes 133 general purpose input/output (GPIO) pins, and each can be configured as a digital input or digital output. Inputs can be set to have a pull-up, pull-down, keeper, or no-pull. Output drive strength is also programmable. Software assigns functions to the GPIOs and their configurations are set accordingly. Some of the GPIO pins have alternate functions supported on them. The alternate functions include USB interface, additional RAM, ROM, general-purpose chip selects, parallel LCD interface, and a UART interface. The function of these pins is documented in the various software releases.

3.9.10. UART

The MSM7227T device employs three UARTs. UART1 has dedicated pins while UART2 and UART3 share multiplexed pins.

-UART1 for Bluetooth

-UART2 for USIM interface

-UART3 for data

.

3.9.11. USB

The MSM7227T IC supports one High Speed USB (HS-USB) USBH port with built-in PHY and one Full Speed USB-UICC port. The MSM7227T IC supports USB interfaces using two controllers:

-The primary controller is the HS-USB port with an integrated physical layer (PHY). This HS-USB port is also capable of supporting USB operations at low-speed and full-speed.

-The secondary controller is the FS USB-UICC port, which only supports host mode functionality.

3.10 Power Block

3.10.1. General

MSM7227T, included RF, is fully covered by PM7540 (Qualcomm PMIC). PM7540 cover the power of MSM7227T, MSM memory, RF block, Bluetooth, USIM and TCXO.

Major power components are :

PM7540 (U403) : Phone main PMIC

3.10.2 PM7540

The PM7540 device (Figure) integrates all wireless handset power management. The power management portion accepts power from all the most common sources – battery, external charger, adapter, coin cell back-up – and generates all the regulated voltages needed to power the appropriate handset electronics. It monitors and controls the power sources, detecting which sources are applied, verifying that they are within acceptable operational limits, and coordinates battery and coin cell recharging while maintaining the handset electronics supply voltages. Eight programmable output voltages are generated using low dropout voltage regulators, all derived from a common trimmed voltage reference. A dedicated controller manages the TCXO warm-up and signal buffering, and key parameters (under-voltage lockout and crystal oscillator signal presence) are monitored to protect against detrimental conditions. MSM device controls and statuses the PM7540 IC using Single-wire SBI(SSBI) supplemented by an Interrupt Manager for time-critical information. Another dedicated IC Interface circuit monitors multiple trigger events and controls the power-on sequence.

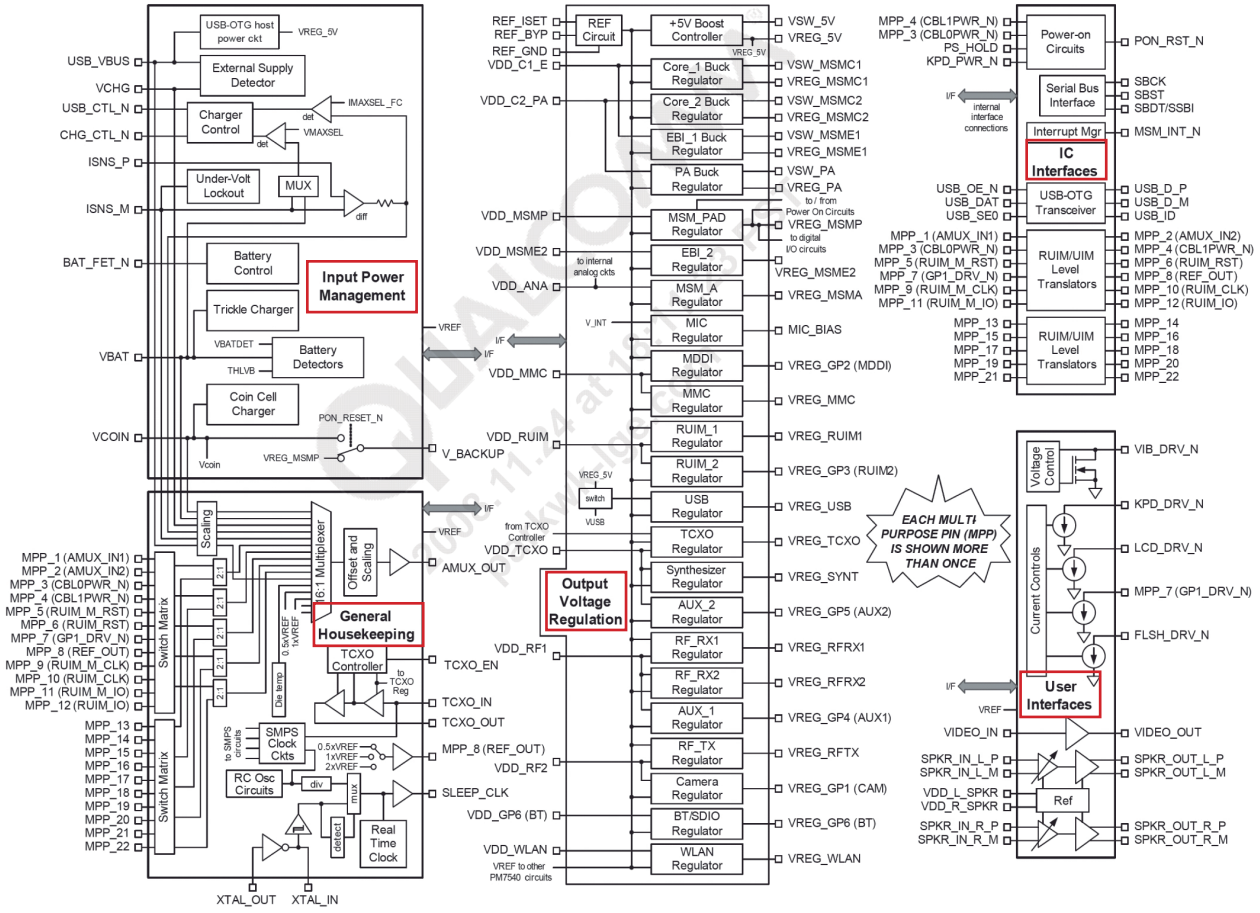


Figure. PM7540 functional block diagram

3.10.3. Charging control

The RT8965 integrates a single-cell Li-ion battery charger IC with pre-charge mode, a fast charge mode (constant current mode) or constant voltage mode. The charge current is programmable via the I2C interface as shown in the control register address tables, CHG_Ctrl1 and CHG_Ctrl2. The CV mode voltage is fixed at 4.2V. The pre-charge threshold is fixed at 2.6V. If the battery voltage is below the pre-charge threshold, the RT8965 charges the battery with a trickle current until the battery voltage rises above the pre-charge threshold. The RT8965 is capable of being powered up from AC adapter and USB (Universal Serial Bus) port inputs. Moreover, the RT8965 includes a linear regulator (LDO 4.9V, 50mA) for supplying low power external circuitry.

3.10.3.1. Pre-Charge Mode

Figure 1 shows the RT8965 charging state of the charging function. During a charge cycle, if the battery voltage is below the VPRECH threshold (typical value is 2.6V), the charger enters pre-charge mode. This feature revives deeply discharged cells and protects battery life. The precharge current has a typical value of 50mA.

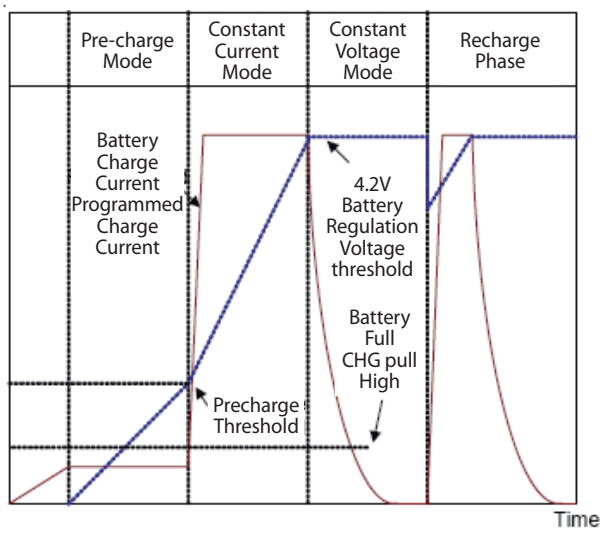


Figure. RT8965 Charging State of the Charger Function

3.10.3.2. Constant Current Charging

Once the battery voltage is higher than 2.6V, the charger enters the constant current stage. The constant current level can be programmed from 90mA to 1A via the I2C compatible interface but the default value is 400mA.

3.10.3.3. Constant Voltage Charging

Once the battery voltage level closes in at 4.2V, the charger enters constant voltage phase and the charging current begins to decrease. When the charging current becomes lower than IEOC (end of charge current), the loop enters charge done mode. The RT8965 will then send an interrupt and register CHG bit, as shown in Table 10. Finally, INT_STA2 becomes 0 to indicate that the RT8965 has completed the charging.

3.10.3.4. Recharge Phase

When any loading or event causes VBAT to drop or battery to discharge, the charger will automatically jump to the appropriate mode to recharge the battery.

3.10.3.5. Charger for Factory Mode

The RT8965 provides factory mode for supplies up to 2.3A for powering external loads with no battery installed and V_{BAT} is regulated to 4.2V. The factory mode allows the user to supply system power with no battery connected. It is programmable by I^2C via the PTM bit, as shown in Table 13. In factory mode, thermal regulation is disabled, but thermal protection (135 C) is still active. When using currents greater than 1.5A in factory mode, the user must limit the duty cycle at the maximum current to 20% with a maximum period of 10ms

3.10.3.6. LGE510 Charging Specification

-Charging Method : Pre-Charging & CC & CV (Pre-Charging &Constant Current & Constant Voltage)

-Maximum Charging Voltage : 4.2V

-Maximum Charging Current : 700mA

-Nominal Battery Capacity : 1500mAh

-Charging time : Max. 3h 30m

- Full charge indication current (icon stop current) : 89mA

3.10.3.7. LGE510 battery bar icon display

Battery Bar Number	Specification	
BAR 6 (Full)	90% over	Remain %
BAR 6 --> 5	90% → 89%	
BAR 5 --> 4	70% → 69%	
BAR 4 --> 3	50% → 49%	
BAR 3 --> 2	30% → 29%	
BAR 2 --> 1	15% → 14%	
BAR 1 --> 0	5% → 4%	
Low Battery Pop-up	4% ~ 15% : One Time popup (No call)	
Critical Low Battery Pop-up	0% ~ 3% : Popup at every level change (No call)	
POWER OFF	0%	

Table. LGE510 battery bar specification

3.11 External memory interface

3.11.1. MSM7227T

The MSM7227T device was designed to provide two distinct memory interfaces. EBI1 was targeted for supporting DDR synchronous memory devices. EBI2 was targeted towards supporting slower asynchronous devices such as LCD, NAND flash, SRAM, NOR flash etc. To support the high-bandwidth, high-density, and low-latency requirements of the advanced on-chip applications, the MSM7227T IC has two high-speed, high-performance memory slave interfaces: the external bus interface 1 (EBI1) and the stack memory interface (SMI). To achieve higher bandwidth and better use of the memory device interface, the SMI accepts multiple commands for the external memory device. The SMI interface acts as a slave device to all of the bus masters within the MSM device. The masters arbitrate to gain access to the SMI, and upon obtaining the access, they issue commands to the SMI. The bus masters are connected to the SMI through an advanced extensible interface (AXI) bus bridge (or global interconnect block) and communicate over a 64-bit, non-blocking AXI bus protocol. The AXI bus bridge provides the arbitration logic for all of the bus masters.

EBI1 Features

- Support for only low-power memories at 1.8-V I/O power supply voltage
- AXI bus frequencies up to 133 MHz
- A 16-bit/32-bit static and dynamic memory interface

DDR SDRAM interface features include:

- Supports both 32-bit DDR SDRAM devices, up to 133-MHz bus speed
- Supports auto precharge and manual precharge
- Supports partial refresh
- Separate CKE pin per chip-select to support partial operation mode
- Idle power down to save idling power consumption

EBI2 Features

- Support for asynchronous FLASH and SRAM(16bit & 8bit).
- Interface support for byte addressable 16bit devices(UB_N & LB_N signals).
- 2Mbytes of memory per chip select.
- Support for 8 bit/16bit wide NAND flash.
- Support for parallel LCD interfaces, port mapped of memory mapped(8 or 16 bit)

3.11.2. E510 External memory Interface

-Multi Chip Package : DDR SDRAM and NAND Flash merged 1 package
-4Gbit Mobile DDR SDRAM / 4Gbit NAND Flash

Interface Spec				
Part Name	Product Gr	Maker	Operation Voltage	Speed
MT29C4G96MAZA	NAND	MICRON	1.8V	42ns
PCJA-5IT	SDRAM		1.8V	200MHz

3.12 H/W Sub System

3.12.1. RF Interface

3.12.1.1. RTR6285 (WCDMA_Tx, GSM_Tx/Rx)

MSM7227T controls RF part(RTR6285) using these signals.

-RTR6285_SSBI : SSBI I/F signals for control Sub-chipset

-RTR_TXON : Power AMP on RF part

-RTR_RX_I/Q_M/P, RTR_TX_I/Q_M/P : I/Q for T/Rx of RF

-RTR_DAC_REF : Reference input to the MSM Tx data DACs

3.12.1.2. the others

TRK_LO_ADJ : TCXO(19.2M) Control

PA_ON0/PA_RANGE0 : WCDMA(2100) TX Power Amp Enable

ANT_SEL[0-3] : Ant Switch Module Mode Selection(WCDMA,GSM Tx/Rx,DCS-PCS Tx/Rx)

GSM_PA_RAMP : Power Amp Gain Control of APC_IC

3.12.1.3. RF2815 (GPS LNA)

* GPS_LNA_EN : GPS LNA Enable Signal (GPS LNA Shutdown)

3.12.1.4. BCM4330FKFFBG (BT / WiFi /FM chip)

WiFi

* WLAN_CMD : WLAN SDIO Command Line.
* WLAN_CLK : WLAN SDIO Clock Input.
* WLAN_SDIO[3:0] : WLAN SDIO Data Line.
* WLAN_RESET_N : Low asserting reset for WLAN core.
* WLAN_WAKEUP : WLAN Wakeup Input.
* WLAN_HOST_WAKEUP : WL_HOST_WAKEUP signal output.

BT

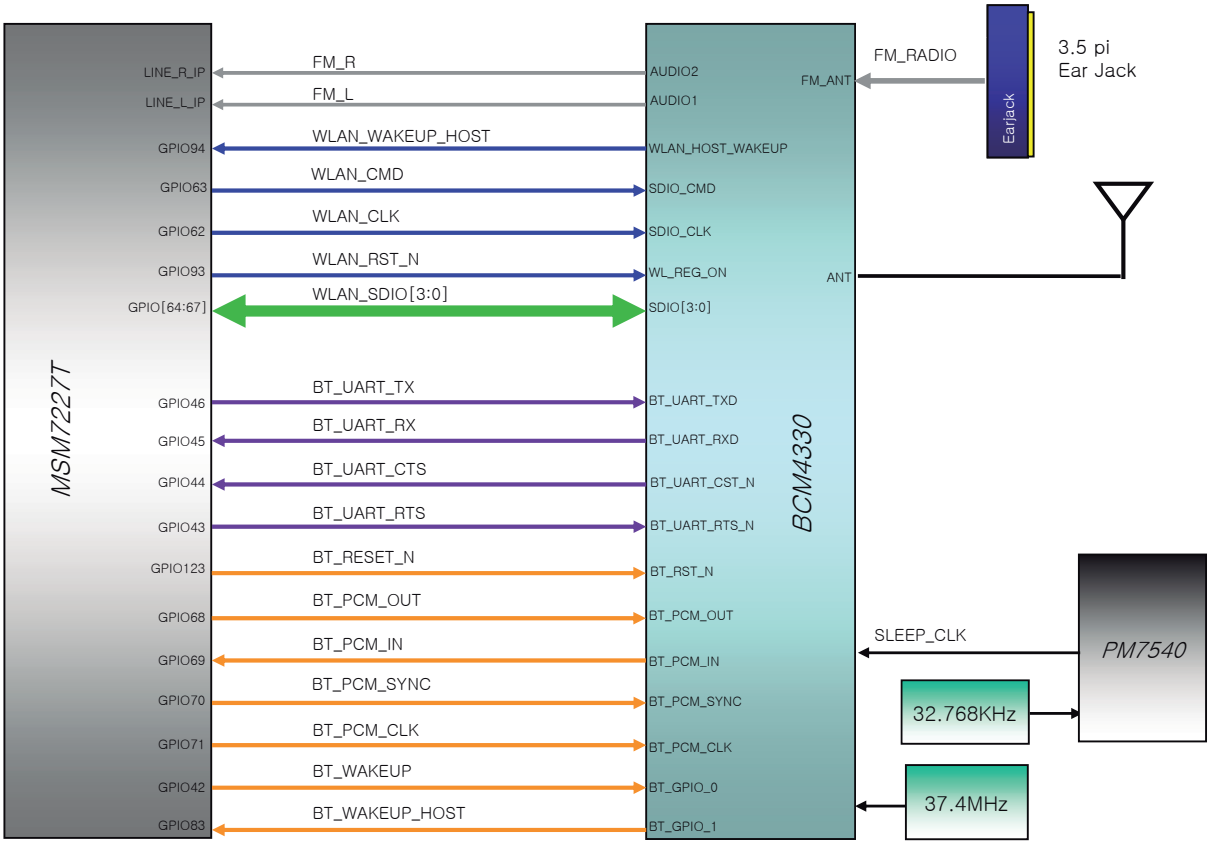
* BT_UART_RXD : Bluetooth UART Serial Input.
* BT_UART_RTS : Bluetooth UART Request to Send. Active-low request.
* BT_UART_CTS : Bluetooth UART Clear to Send. Active-low clear.
* BT_UART_TXD : Bluetooth UART Serial Output.
* BT_PCM_CLK : BT PCM clock, can be PCM-master (output) or PCM-slave (input).
* BT_PCM_DIN : BT PCM data input.
* BT_PCM_SYNC : BT PCM sync signal, can be PCM-master (output) or PCM-slave (input).
* BT_PCM_DOUT : BT PCM data output.
* BT_WAKEUP : BT Wakeup Input.
* BT_HOST_WAKEUP : BT Host Wakeup Output
* BT_RESET_N : Low asserting reset for BT core.

Common

* SLEEP_CLK : LPO clock (32.768kHz) input. Used for low-power mode timing.
* CLK_IN : Crystal amplifier input or frequency reference input.
* CLK_REQ : Crystal Circuit / Reference Clock Enable (active-high)

FM Radio

* FM_ANT : FM RF input.
* SLEEP CLK : External reference oscillator input. (32.768KHz)
* FM_R : Right audio line output – digital input data.
* FM_L : Left audio line output – digital frame synchronization.



Wifi/BT/FM Interface Block Diagram

3.12.2 MSM Sub System

3.12.2.1. USIM Interface

SIM interface scheme is shown in Figure.

And, there control signals are followed

-USIM_CLK : USIM Clock
-USIM_Reset : USIM Reset
-USIM_Data : USIM Data T/Rx

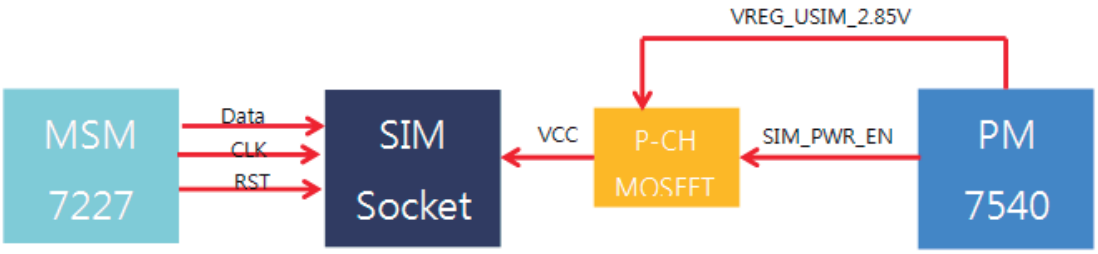


Figure. SIM Interface

3.12.2.2. UART Interface

UART signals are connected to MSM GPIO through IO connector with 115200 bps speed.

GPIO_Map	Name	Note
GPIO_112	UART3_RX	Data_Rx
GPIO_111	UART3_TX	Data_Tx

Table. UART Interface

3.12.2.3. HS-USB

The High-Speed USB module contains an embedded UTMI+ core with a built-in transceiver eliminating the need for an external PHY. The HS-USB port is a standard 4-pin interface that connects directly to the USB connector (USBPHY_DP, USBPHY_DN, USBPHY_ID and USBPHY_VBUS). Two additional pins are required for PHY operations which include an external reference resistor pin (USBPHY_REXT) and a USB system clock pin which the USB PHY uses to lock its internal PLL (SYS_CLK)

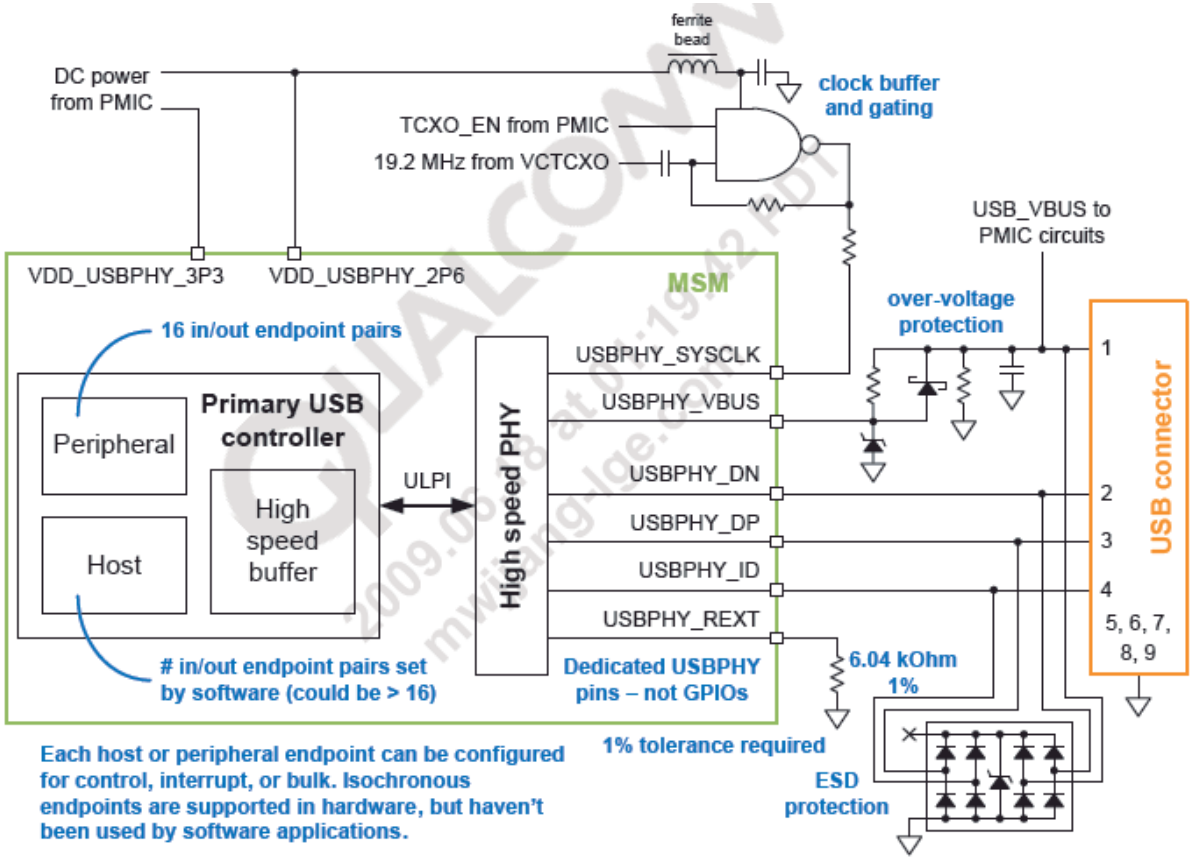


Figure. HS-USB connections and architecture

3.12.3 KEY

3.12.3.1 Side key

There are 2 side key , Send, and END buttons that are controlled by MSM7227T.

Refer to the circuit.

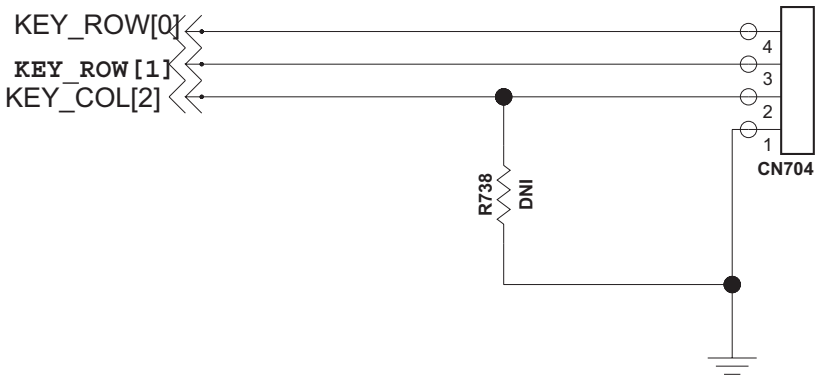


Figure. Volume Side key

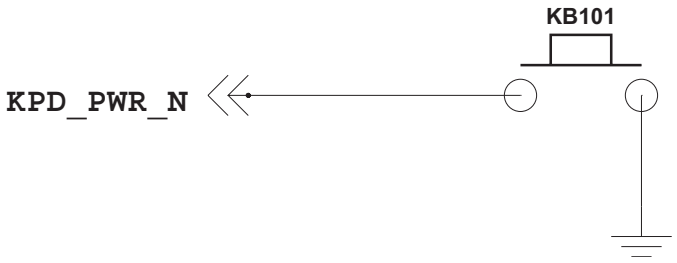


Figure. End key

3.12.3.3 KEY Backlight

There are 3 White side view LED, 3 white LED in key backlight circuit

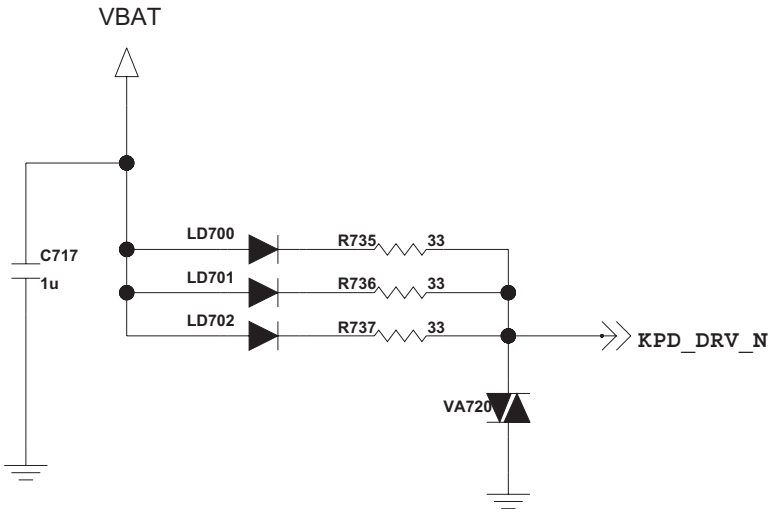
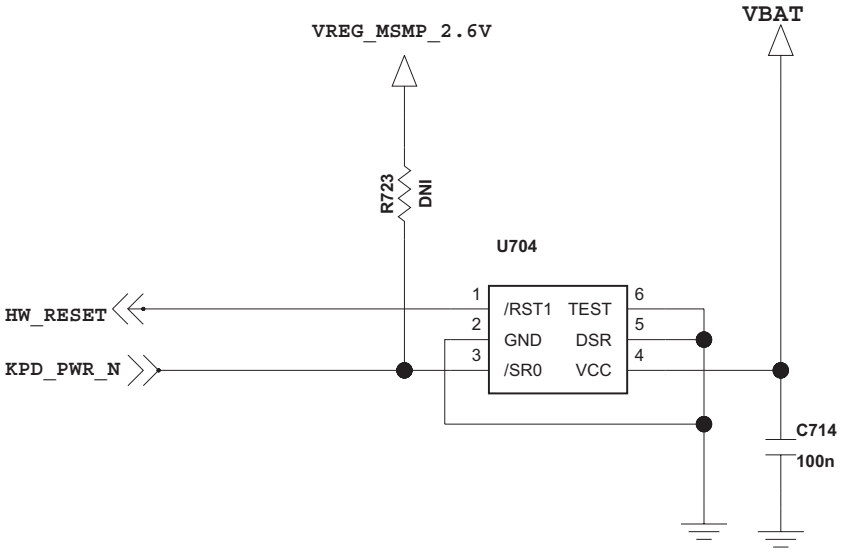


Figure. KEY Backlight

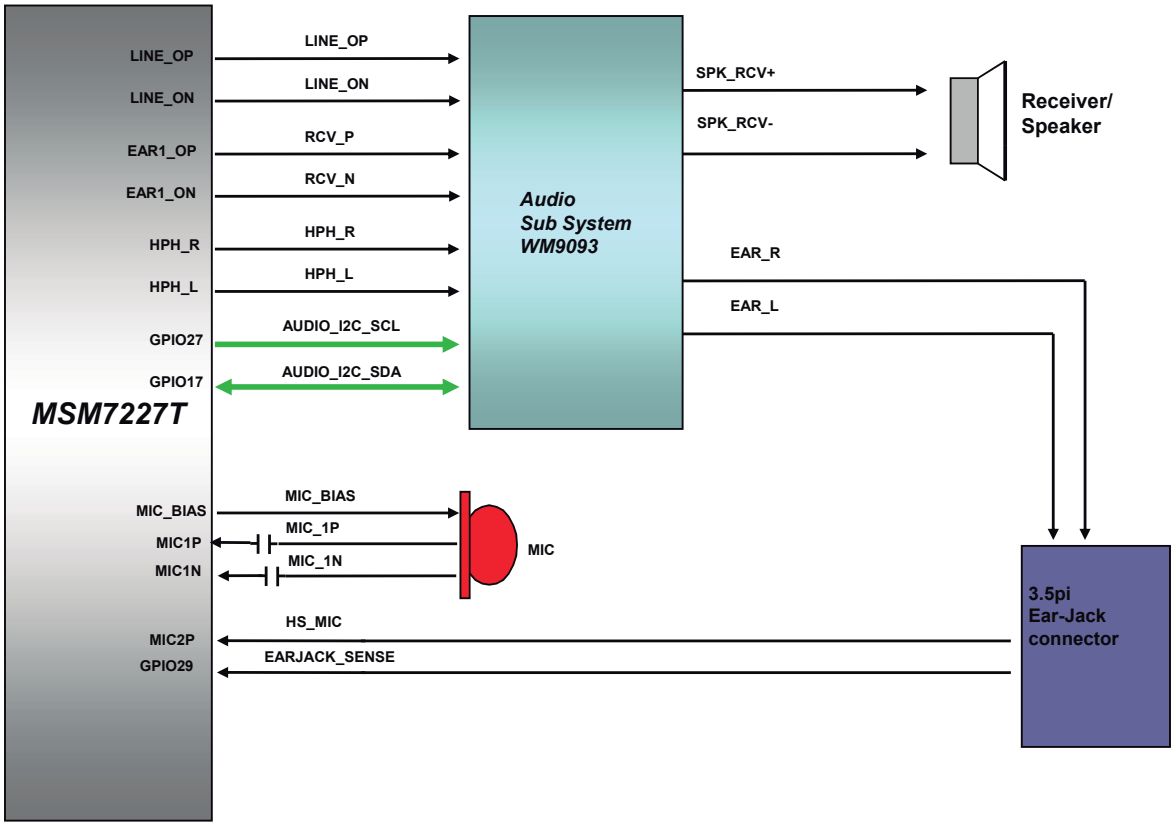
3.12.3.4 Reset key

There is Hardware Reset IC



3.13 Audio and sound

3.13.1 Overview of Audio path



Wifi/BT/FM Interface Block Diagram

3.13.2. Audio signal processing & interface

3.13.2.1 MSM7227T audio interface

The MSM7227T audio front end comprises the stereo wideband codec, PCM interface, and additional DSP audio processing. The stereo wideband codec allows the MSM7227T device to support stereo music/ringer melody applications in addition to the 8 kHz voice band applications on the forward link.

In the audio transmit path, the device operates as 13-bit linear converter with software, selectable 8 kHz and 16 kHz sampling rate. In the audio receive path, the device operates as a software-selectable 13-bit or 16-bit linear converter with software selectable 8 kHz,16 kHz, 22.05 kHz, 24 kHz, 32 kHz, 44.1 kHz, or 48 kHz sampling rate. Through software, the Rx path can be configured as either a mono or stereo output. New to the MSM7227T device is a transmit (Tx) ADC path that now supports stereo wideband sampling.
The integrated codec contains all of the required conversion and amplification stages for the audio front end. The codec operates as a 13-bit linear codec with the transmit (Tx) and receive (Rx) filters designed to meet ITU-T G.712 requirements.

The codec includes a programmable side tone path for summing a portion of the Tx audio into the Rx path. An on-chip voltage/current reference is provided to generate the precise voltages and currents required by the codec. This circuit requires a single capacitor of 0.1 µF to be connected between the CCOMP and GND pins. The on-chip voltage reference also provides a microphone bias voltage required for electret condenser microphones typically used in handset applications. The MICBIAS output pin is designed to provide 1.8 V DC while delivering as much as 1 mA of current.
Audio decoder summing and headset switch detection are included. The codec interface includes the amplification stages for both the microphone and earphone. On the transmit (Tx) path, the interface supports two differential microphone inputs, a differential auxiliary input, and a stereo line input.
On the receive (Rx) path the interface supports one differential earphone output, a stereo single-ended headphone output, one differential auxiliary output, and stereo single-ended line outputs.
The codec is configured by the codec SBI registers. The codec interface is shown in Figure.

Also part of the audio front end is the PCM interface. The PCM interface allows for an external codec to be used instead of the internal codec. This interface can be used in I2S mode which will allows for an external stereo DAC to be used. Finally, the audio front end includes additional DSP audio processing that does gains, filtering and other audio processing.

The DSP audio processing is configured through the QDSP5000 command types and is not directly controlled by the microprocessor.

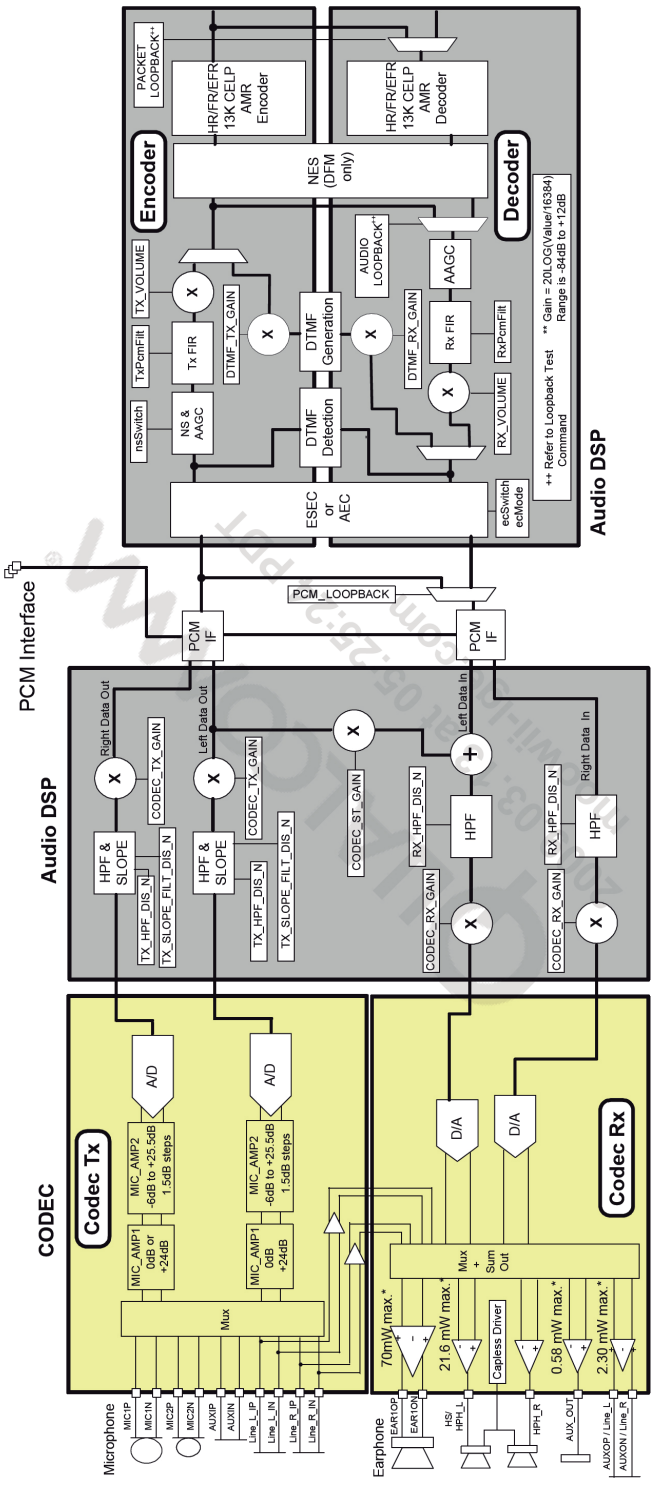


Figure. Detailed diagram of MSM7227T audio interface

3.13.2.2 WM9093 audio interface

The WM9093 is a high performance low power audio subsystem, including headphone driver and Class AB/D earpiece/speaker driver. The Class D speaker driver support 650mV output power at 3.6V, 1%THD.

The unique dual mode charge pump architecture provides ground referenced headphone outputs removing the requirement for external coupling capacitors. Class G technology is integrated to increase the efficiency and extend playback time by optimizing the headphone driver supply voltages according to the volume control.

The flexible input configuration allows single ended or differential stereo inputs. Mixers allow highly flexible routing to the outputs, A 'voice Bypass' path is also available for low-power voice applications.

The WM9093 is controlled using a two-wire I2C interface. An integrated oscillator generates all internal clocks. Removing the need to provide any external clock.

Separate mixer and volume controls are provided for each headphone and speaker driver. Automatic Gain control limits the speaker output signal in order to prevent clipping. DC offset correction to less than 1mV Guarantees a pop/click-free headphone start up.

The WM9093 is available in a 2.0mm × 2.5mm 20-bump CSP package.

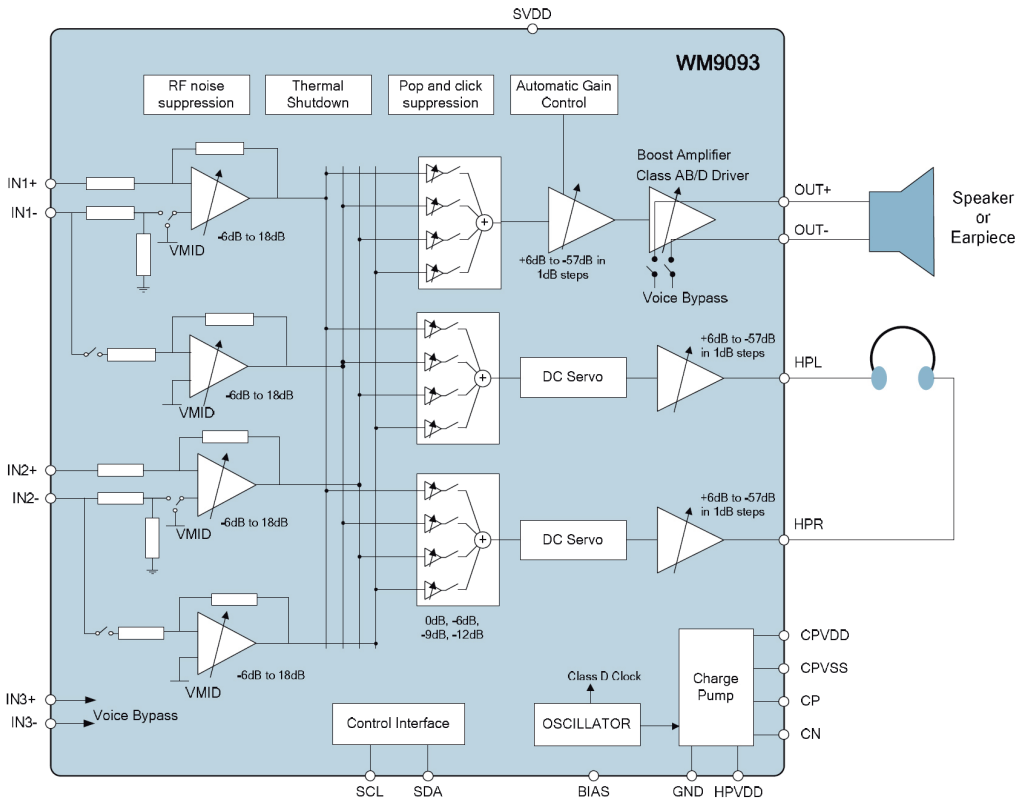


Figure. Detailed diagram of WM9093 audio interface

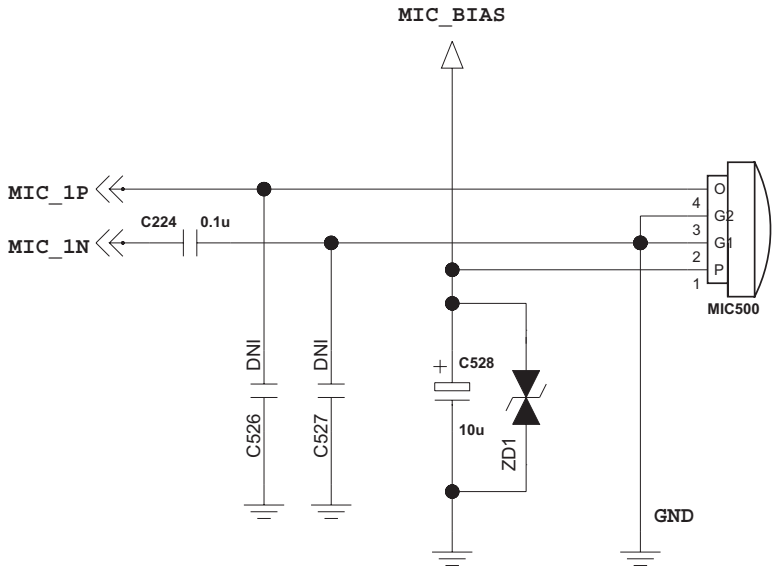
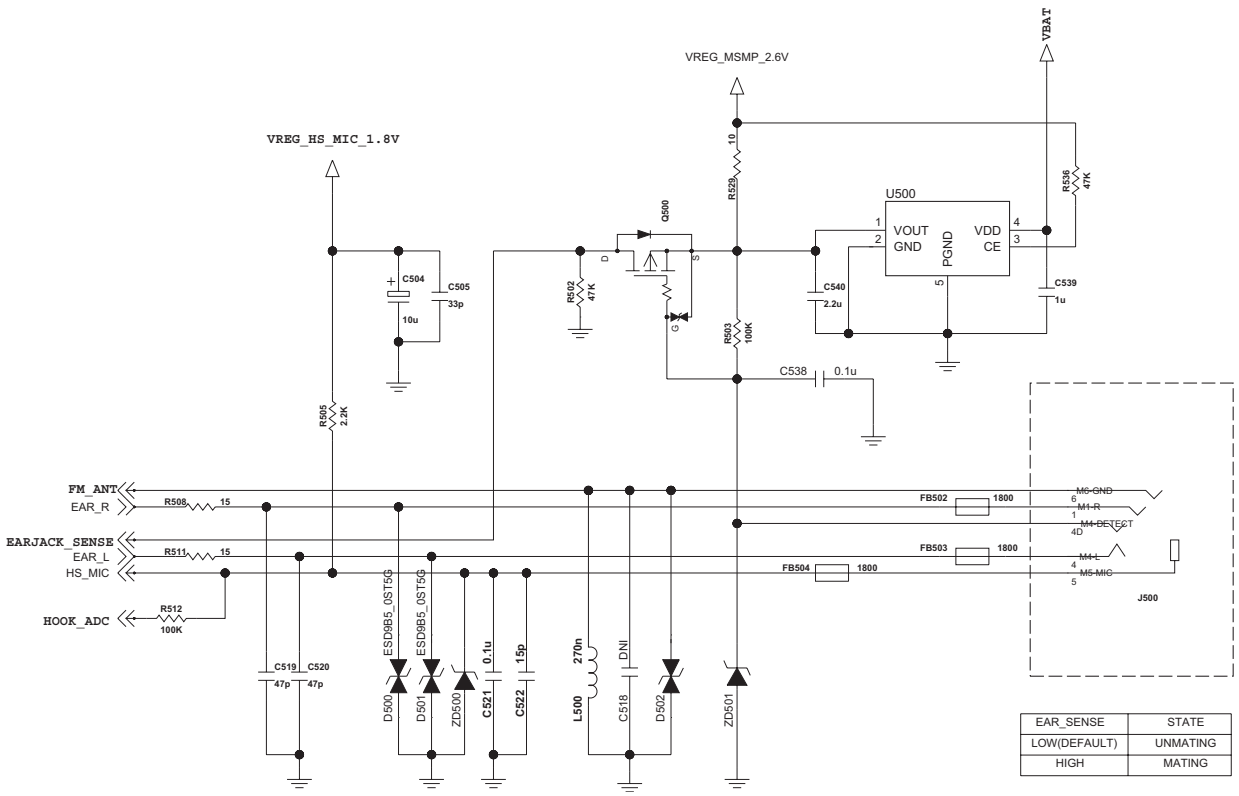


Figure. MIC



EAR_SENSE	STATE
LOW(DEFAULT)	UNMATING
HIGH	MATING

Figure. 3.5pi Ear Jack Connector

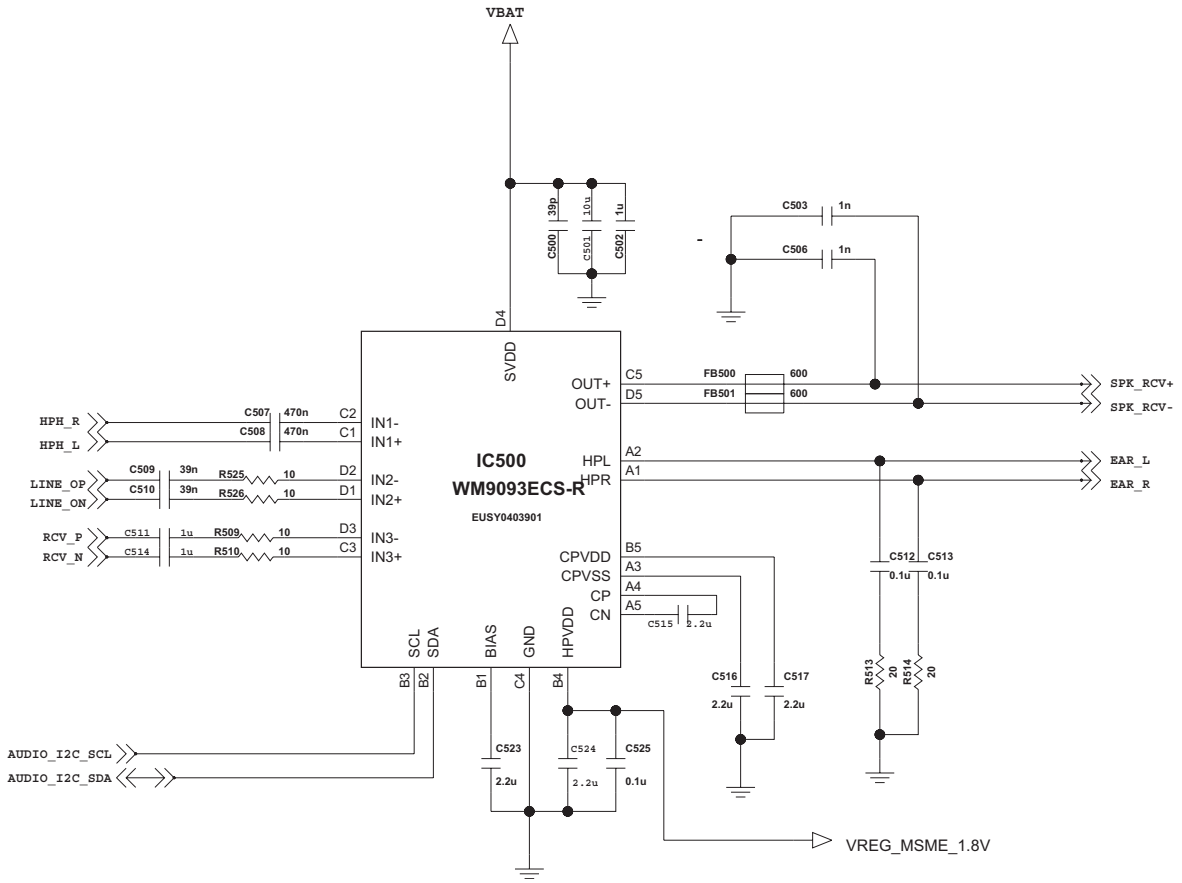


Figure. Audio SUB System

3.14 Display

LCD module is connected to Main PCB with 24-pin connector.

The LCD is controlled by MDDI Interface in MSM7227T.

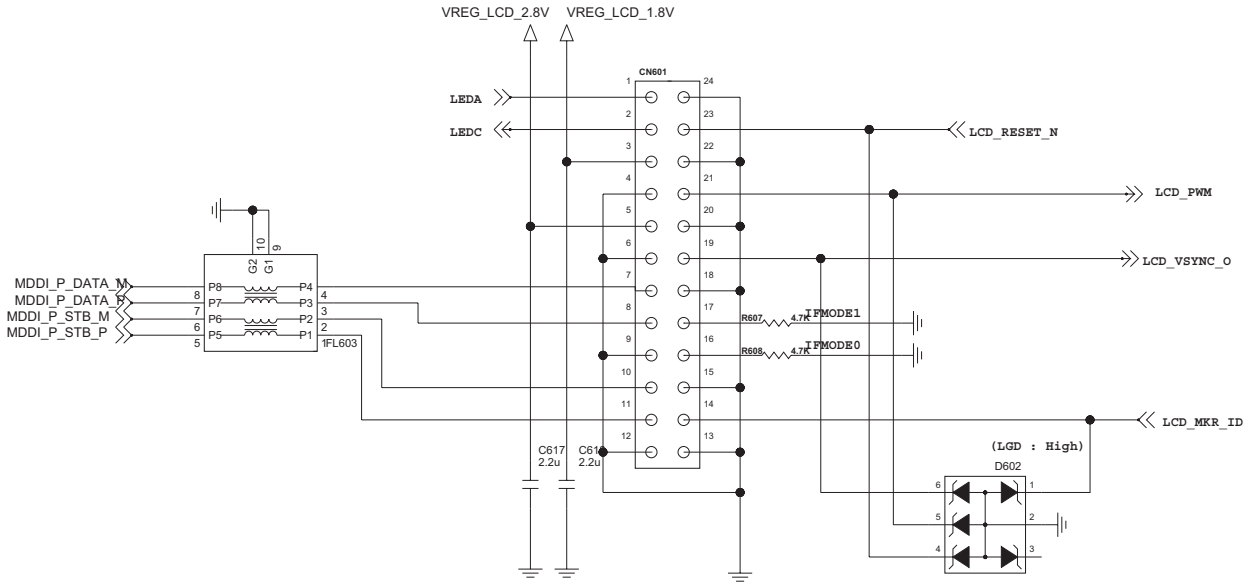


Figure. Schematic of LCD connector (Main Board)

Pin No.	Symbol	Description
1	LED_AN	LED Anode Connection
2	LED_CA	LED Cathode Connection
3	IOVCC	IO Voltage
4	GND	Ground(0V)
5	VCC	Analog Voltage
6	GND	Ground(0V)
7	DATA0N	MDDI & MIPI Data Line
8	DATA0P	MDDI & MIPI Data Line
9	GND	Ground(0V)
10	STB_CLKN	MDDI & MIPI Clock Line
11	STB_CLKP	MDDI & MIPI Clock Line
12	GND	Ground(0V)
13	GND	Ground(0V)
14	IOVCC	IO Voltage
15	GND	Ground(0V)
16	IFMODE0	MIPI(VIDEO or COMMAND Mode), MDDI Select
17	IFMODE1	MIPI(VIDEO or COMMAND Mode), MDDI Select
18	GND	Ground(0V)
19	VSYNC_OUT	Vsync out Signal
20	GND	Ground(0V)
21	PWM	LED PWM (CABC)
22	GND	Ground(0V)
23	RESET	RESET SIGNAL
24	GND	Ground(0V)

Table. Interface between LCD Module and MAIN Board

3.15 Camera Interface (5M Auto Focus)

E510 Installed a 5M Pixel Camera. Below picture shows the camera board to board connector and camera IF

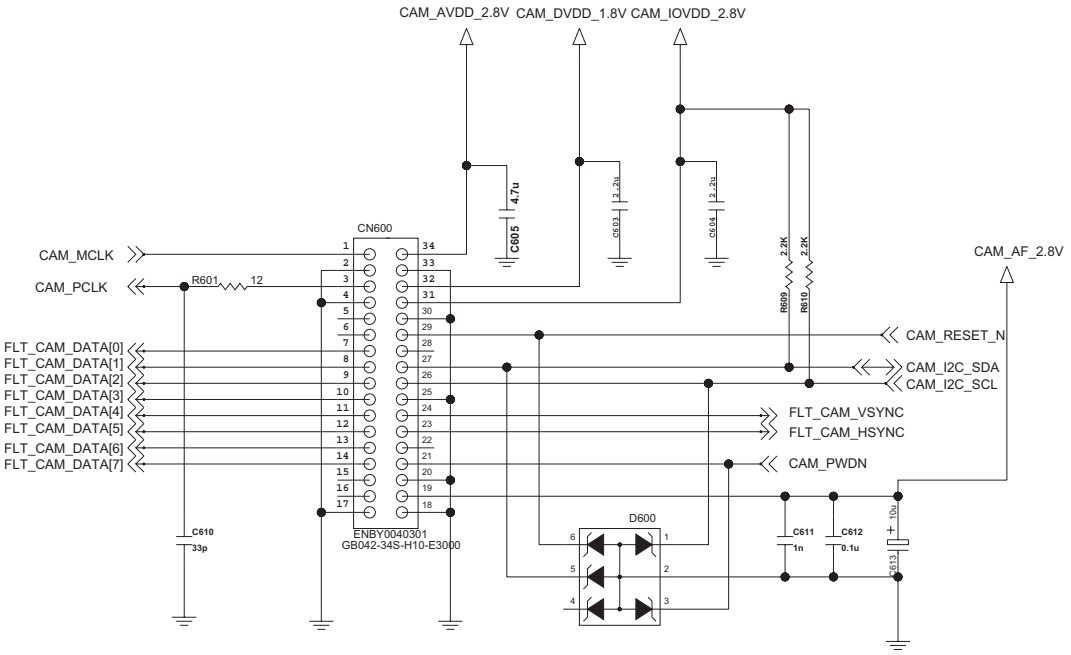


Figure. Camera Connector Schematic

No.	SYMBOL	DESCRIPTION	No.	SYMBOL	DESCRIPTION
1	MCLK	Master clock input	18	GND	Ground
2	GND	Ground	19	LVDD	VCM & Driver IC Power (2.8V)
3	PCLK	Pixel clock output	20	GND	Ground
4	GND	Ground	21	STANDBY	Power Sleep (Active"H")
5	NC	Not Connect	22	NC	Not Connect
6	NC	Not Connect	23	HSYNC	Horizontal sync output
7	D0	Parallel pixel data0	24	VSYNC	Vertical sync output
8	D1	Parallel pixel data1	25	GND	Ground
9	D2	Parallel pixel data 2	26	SCL	Serial interface clock
10	D3	Parallel pixel data3	27	SDA	Serial interface data
11	D4	Parallel pixel data4	28	NC	Not Connect
12	D5	Parallel pixel data5	29	RESET	MASTER RESET (Active"L")
13	D6	Parallel pixel data6	30	GND	Ground
14	D7	Parallel pixel data7	31	IOVDD	I/O power(1.8V or 2.8V)
15	NC	Not Connect	32	DVDD	Digital power(1.8V)
16	NC	Not Connect	33	GND	Ground
17	GND	Ground	34	AVDD	Analog power(2.8V)

Figure. Interface between Camera Module and MAIN Board

3.16 Compass Sensor

If a customer buy the application SW, The Sensor Support a Eletric Compass function

U700 : AMI306 IC used I2C interface to MSM7227T

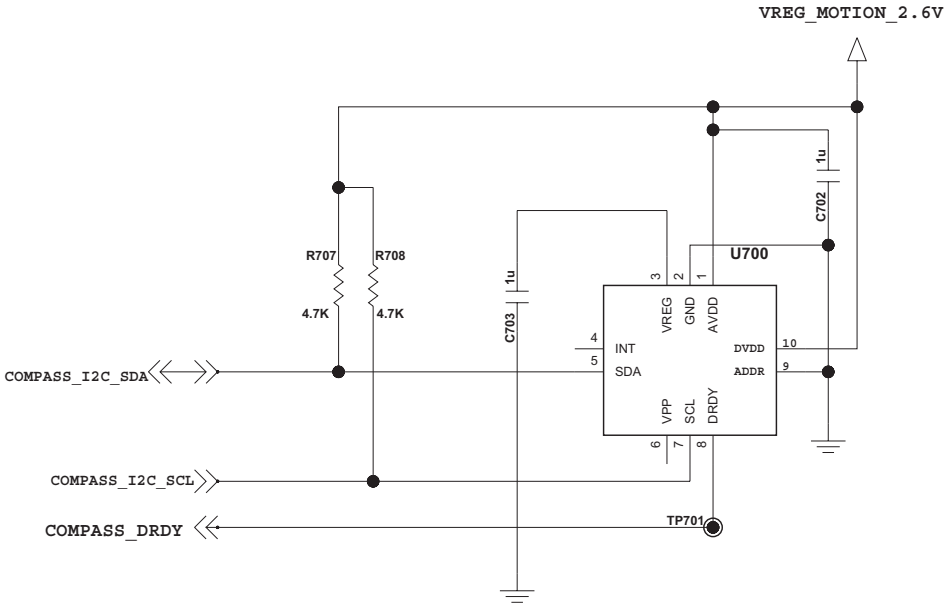


Figure. Compass Sensor Schematic

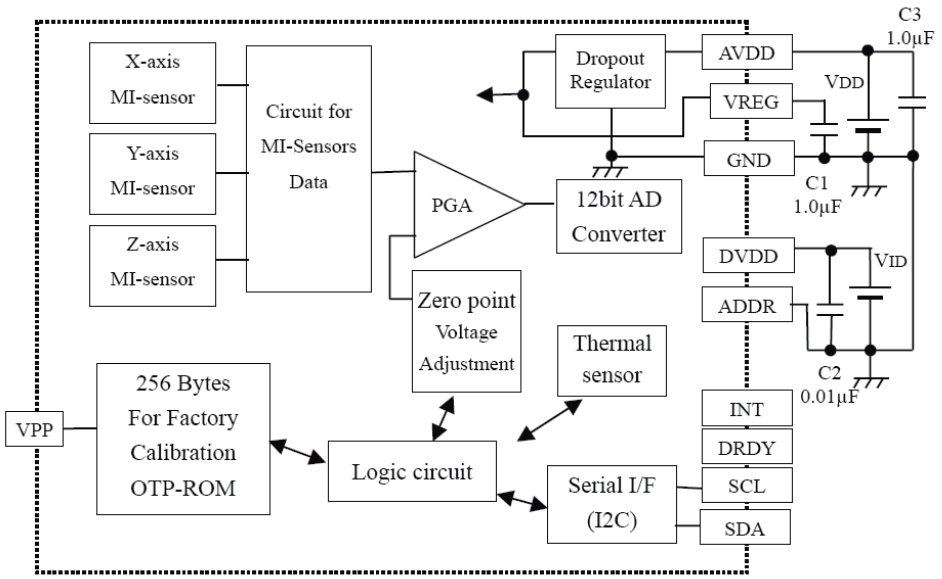


Figure. Compass Sensor Block Diagram

3.17 Motion Sensor

According to tilt the cell phone, the screen is had rotated automatically.

U701 : KR3DH IC used I2C interface to MSM7227T

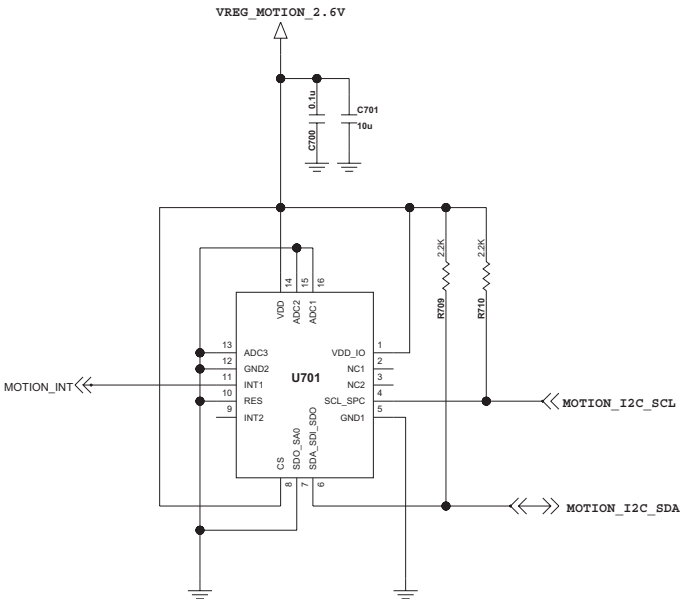


Figure. Motion Sensor Schematic

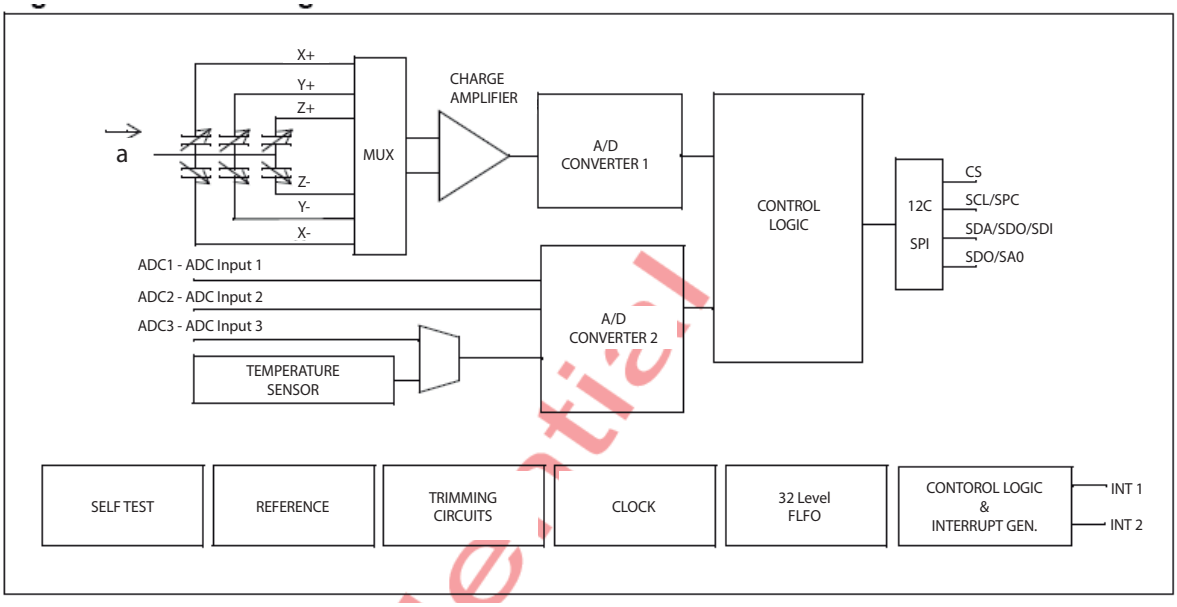


Figure. Motion Sensor Block Diagram

3.18 Proximity Sensor

According to tilt the cell phone, the screen is had rotated automatically.

U702 : GP2AP002S00F IC used I2C interface to MSM7227T

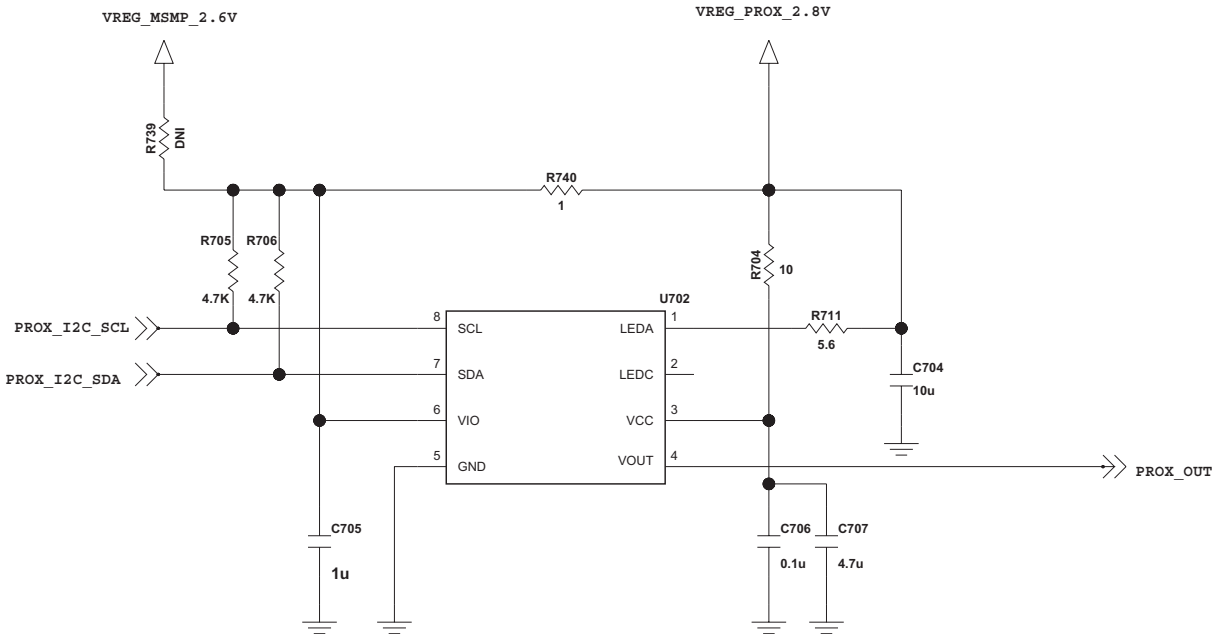
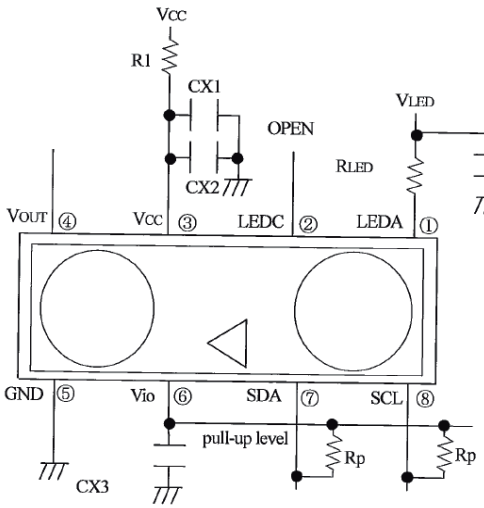


Figure. Proximity Sensor Schematic



Components		Recommended values
CX1		4.7 μF (Ceramic)
CX2		0.1 μF (Ceramic)
CX3		1.0 μF (Ceramic)
CX4		10 μF (Ceramic)
R1	1/16W	10 Ω
RLED	1/16W	6.8 Ω (VLED=3.3V) Operation mode B1
		1.0 Ω (VLED=2.9V) Operation mode B2

Figure. Motion Sensor Block Diagram

3.19 Vibrators (DC Motor)

DC Motor is controlled by PM7540

Figure. PMIC Control Port

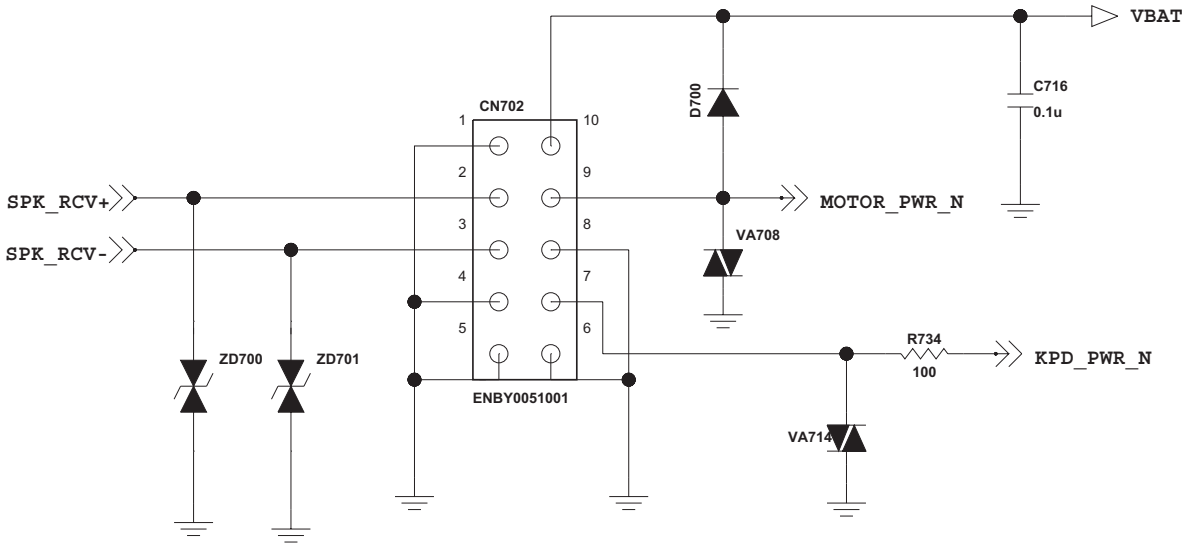


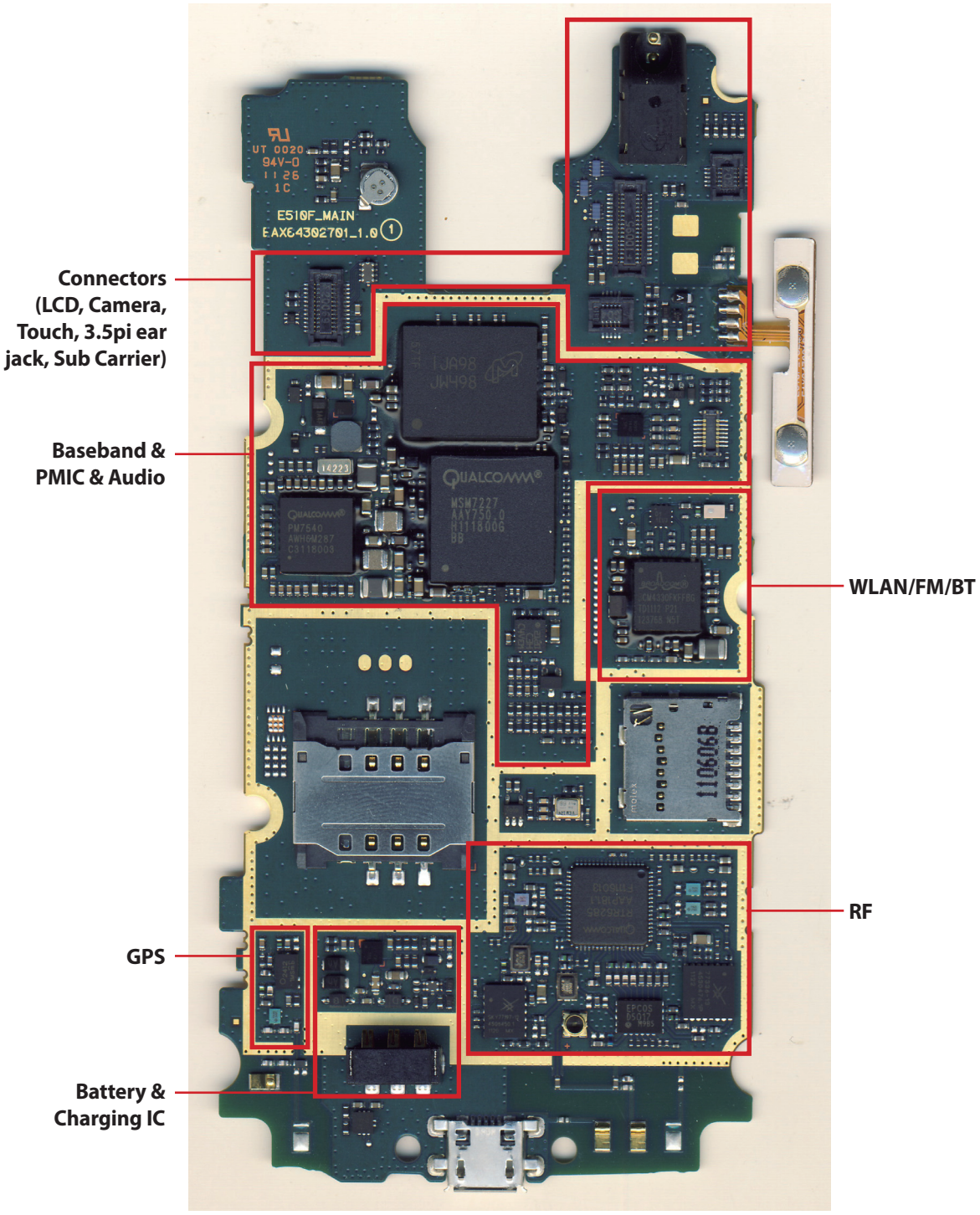
Figure. Vibrator via CN702

3.20 Main Features

3.20.1. E510 Main Features

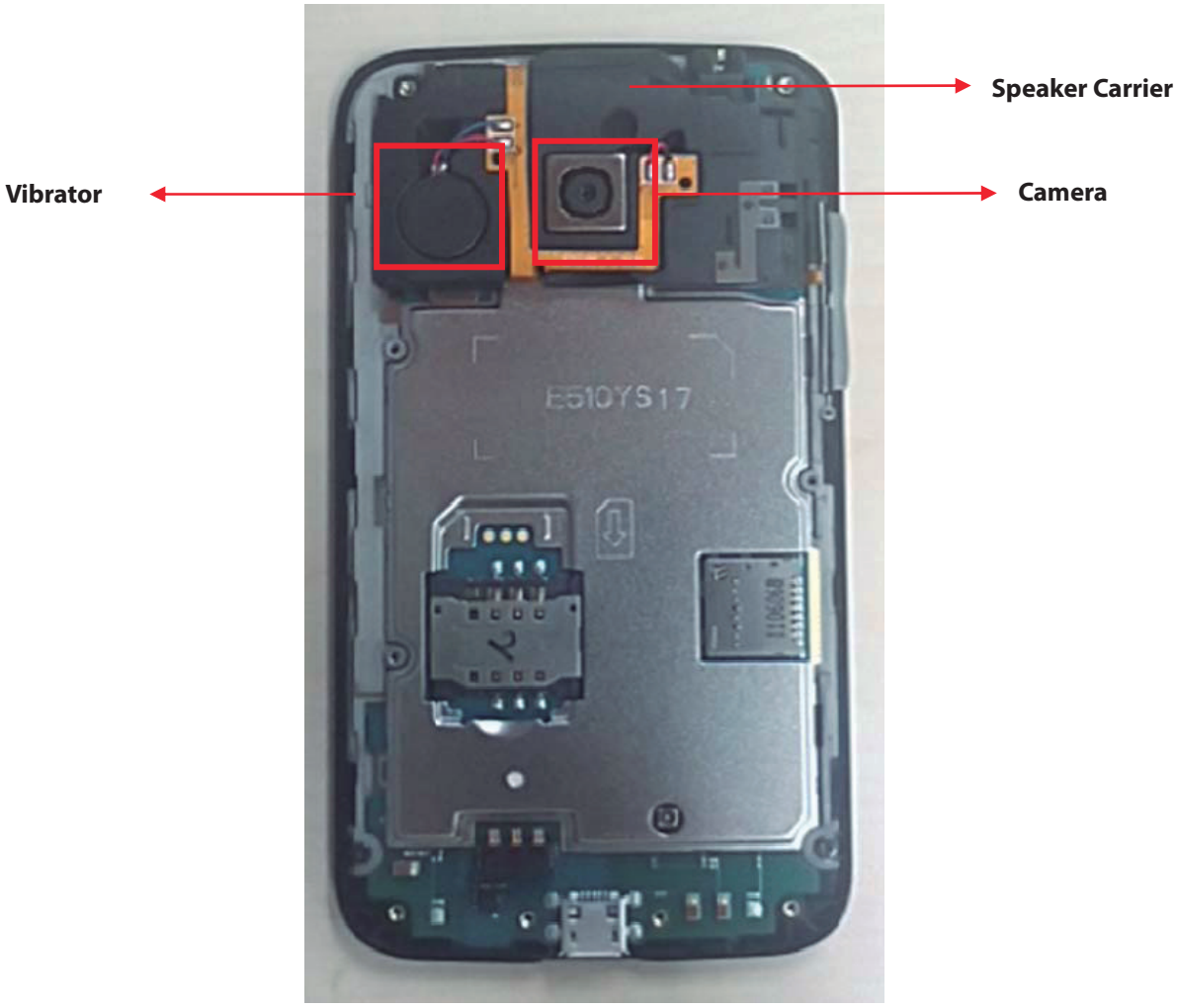
- DOP Type design
- UMTS 2100 + UMTS 900 + GSM 900 + DCS 1800 + PCS 1900 + GSM850 based GSM/GPRS/EDGE/UMTS
- HSDPA 3.6Mbps
- TFT Main LCD(3.5' QVGA, 320 x 480)
- Capacitive/Electrostatic Touch Window
- 5M AF Camera
- 3.5Phi Stereo Headset & Speaker phone
- Mobile XMF –Mobile DLS / Scaleable Polyphony
- MP3/AMR/AAC/AAC/WAV/WMA decoder and play
- MPEG4 encoder/decoder and play/save
- JPEG en/decoder
- Supports Bluetooth and HS-USB
- Supports WLAN(802.11b, 802.11g)
- Supports FM Radio
- 1500 mAh (Li-Ion)

3.20.2. E510 Main component (bottom)



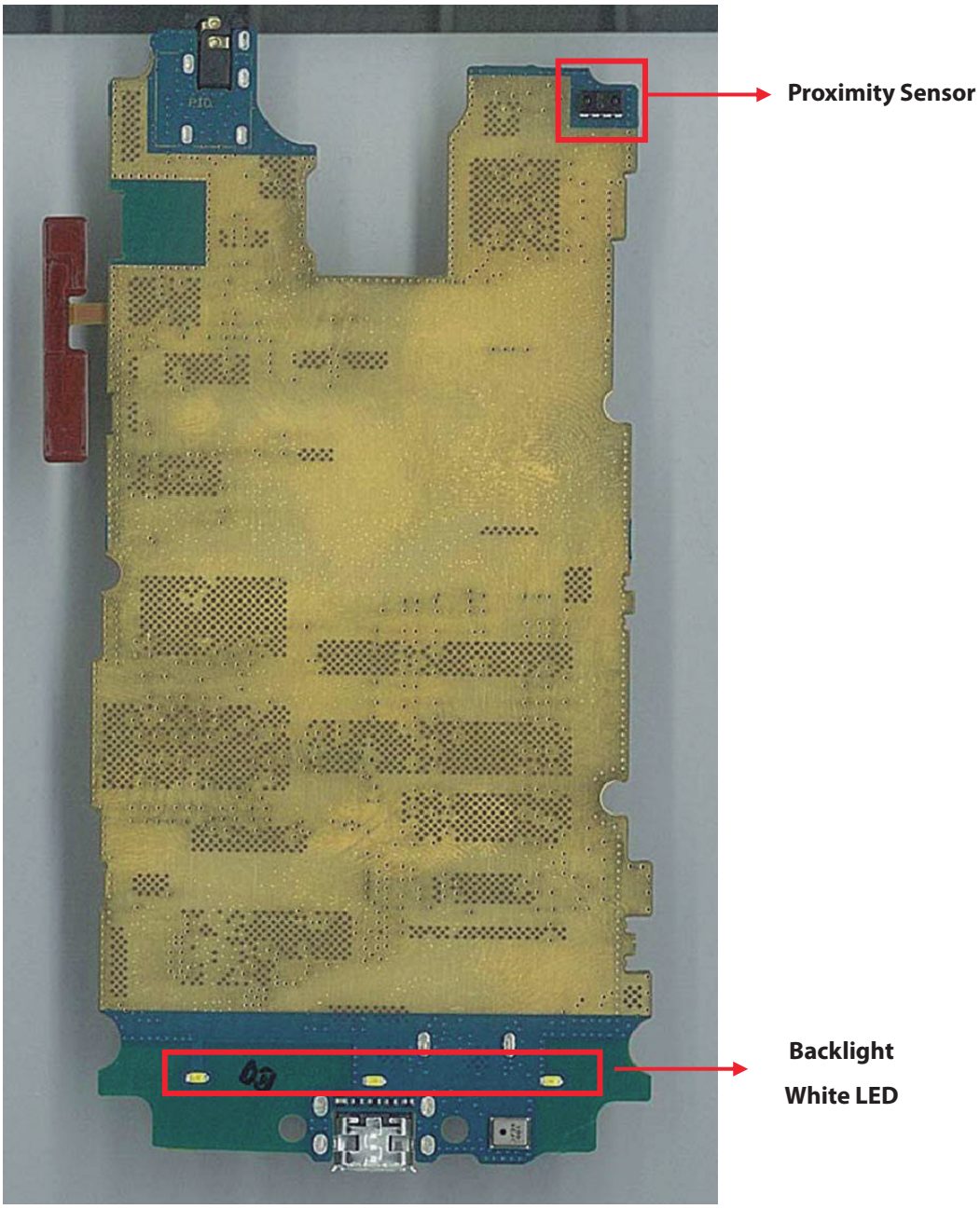
Main Board Bottom

3.20.2. E510 Main component (bottom & Sub carrier)



Main Board Bottom & Sub carrier

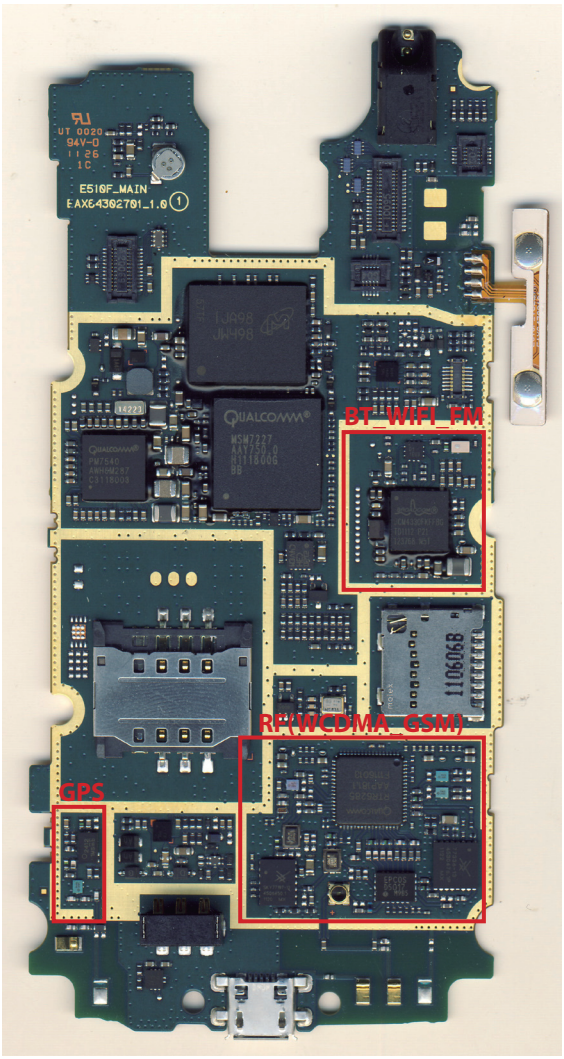
3.20.2. E510 Main component (Top)

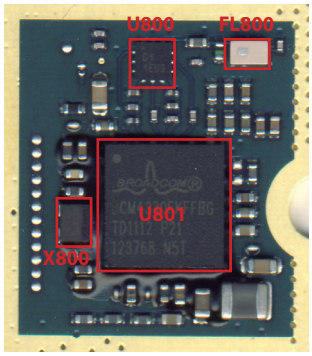


Main Board Top

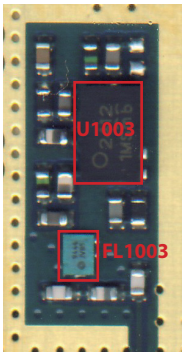
4. TROUBLE SHOOTING

4.1 RF Component

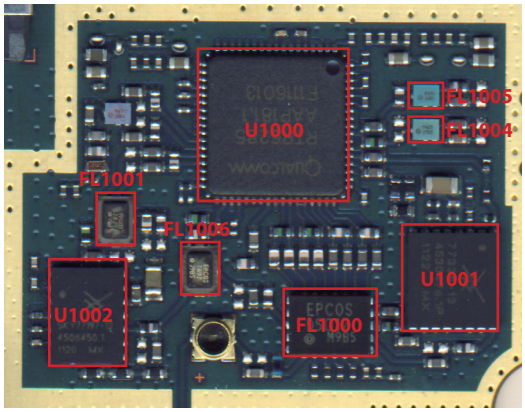




BT_WIFI_FM



GPS

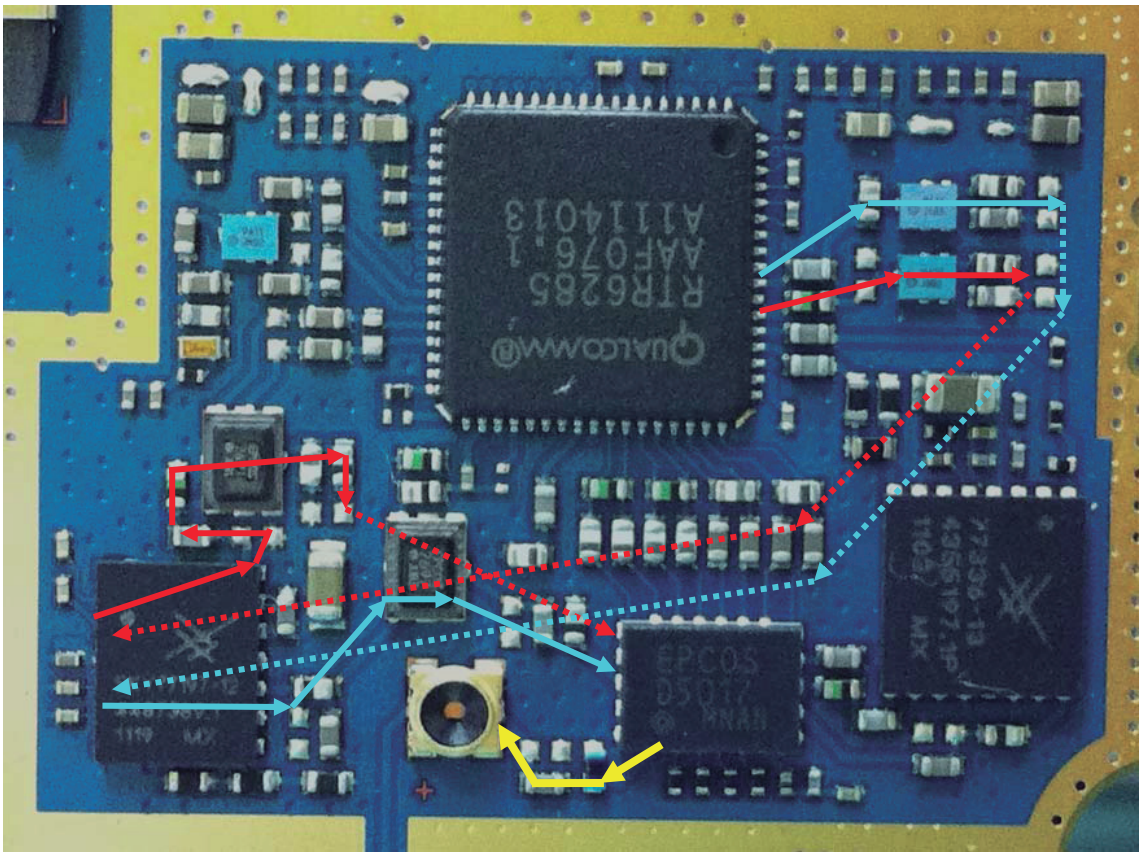


RF(WCDMA_GSM)

RF component (WCDMA / GSM/ Connectivity)

Reference	Description	Reference	Description
U1000	RTR6285(Transceiver)	FL1004	WCDMA Band VIII Tx SAW filter
U1001	GSM Quad PA Module (GSM/EDGE PAM)	FL1005	WCDMA Band I Tx SAW filter
		FL1006	WCDMA Band I Duplexer
U1002	WCDMA Dual Band PAM (BAND I, VIII)	U1003	GPS LNA Module
		FL1003	GPS SAW filter
FL1000	Front-End Module	U801	BT_WIFI_FM CoB
FL1001	WCDMA Band VIII Duplexer	U800	BT_WIFI Switch
FL1002	WCDMA Band I Rx SAW filter	FL800	BT_WIFI_2.4GHz SAW

4.2 SIGNAL PATH

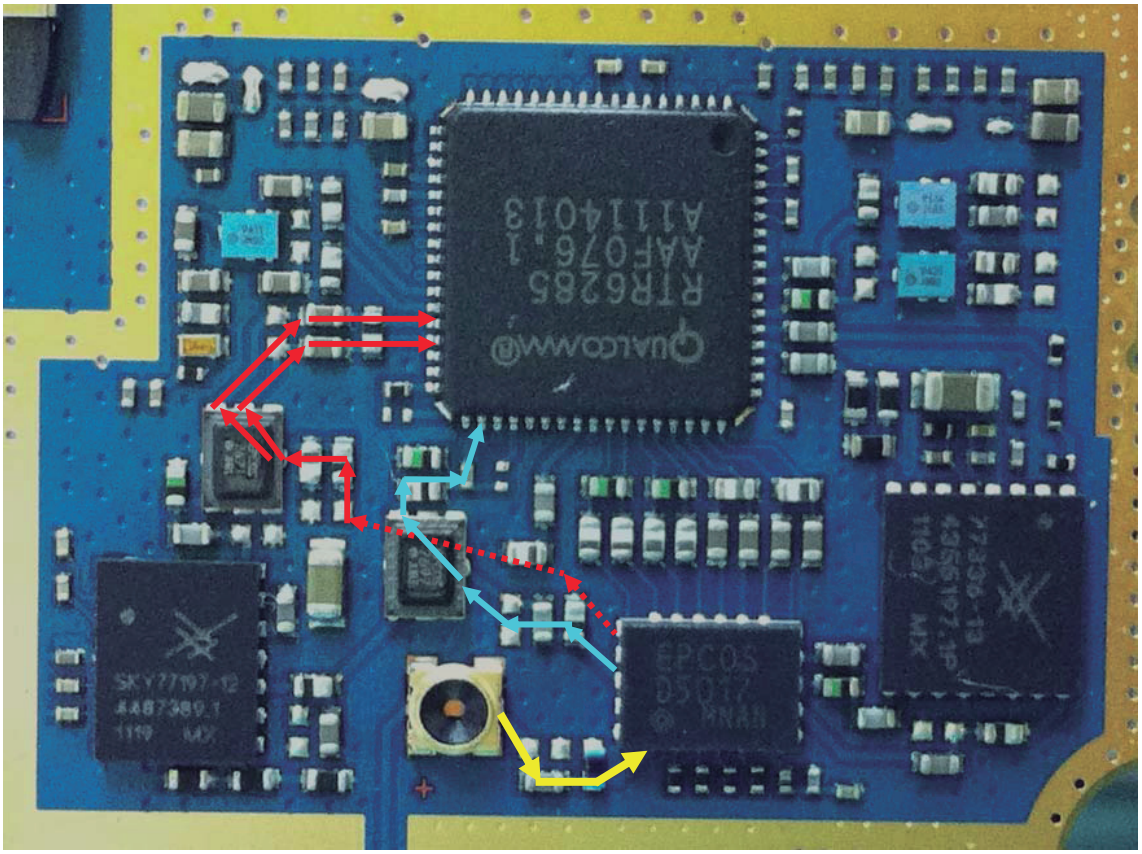


[WCDMA I and VIII Band TX Signal PATH]

D2. WCDMA 2100 TX PATH

E2. WCDMA 900 TX PATH

COMMON PATH

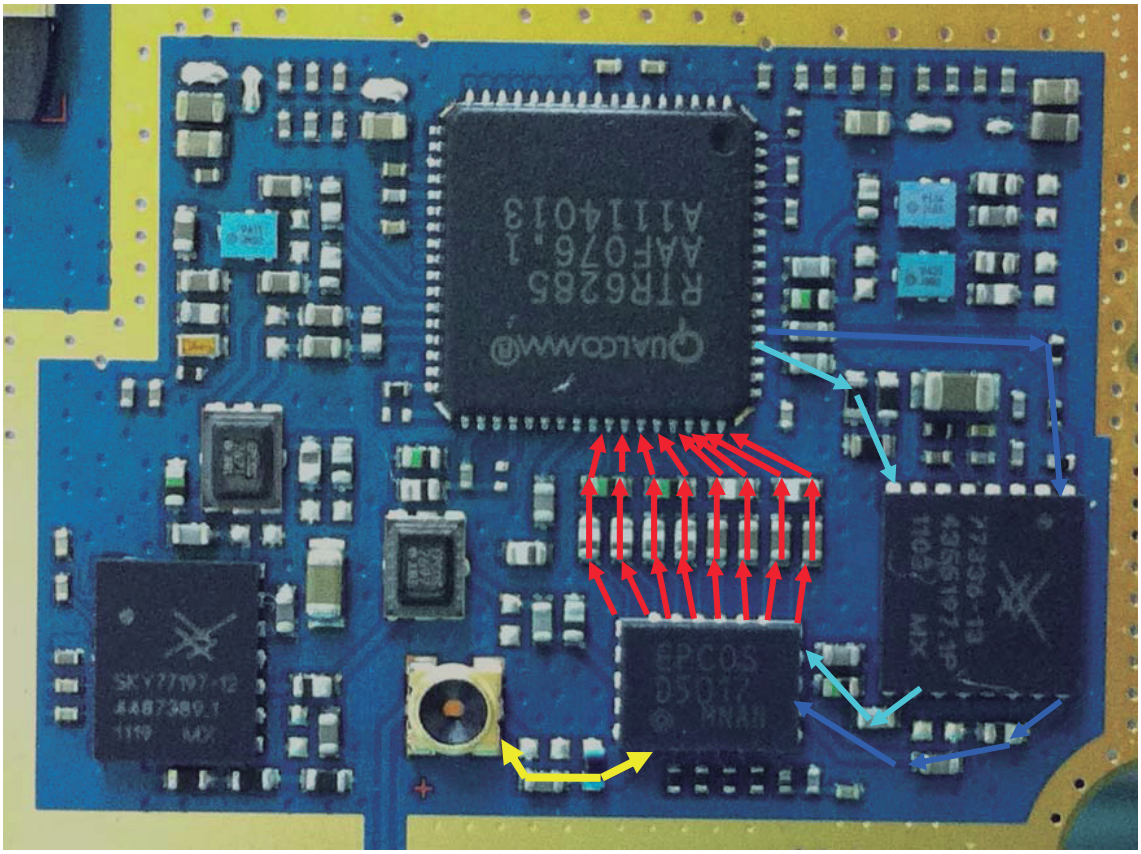


[WCDMA BAND I and VIII RX Signal PATH]

D1. WCDMA 2100 RX PATH

E1. WCDMA 900 RX PATH

COMMON PATH



[GSM850/GSM900/DCS/PCS's RX/TX Signal PATH]

A. GSM850/GSM900/DCS1800/PCS1900 RX PATH

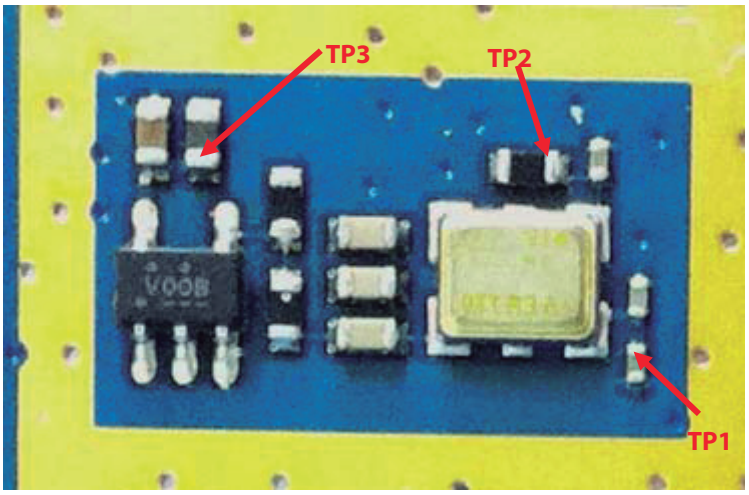
B. GSM850/GSM900 TX PATH

C. DCS1800/PCS1900 TX PATH

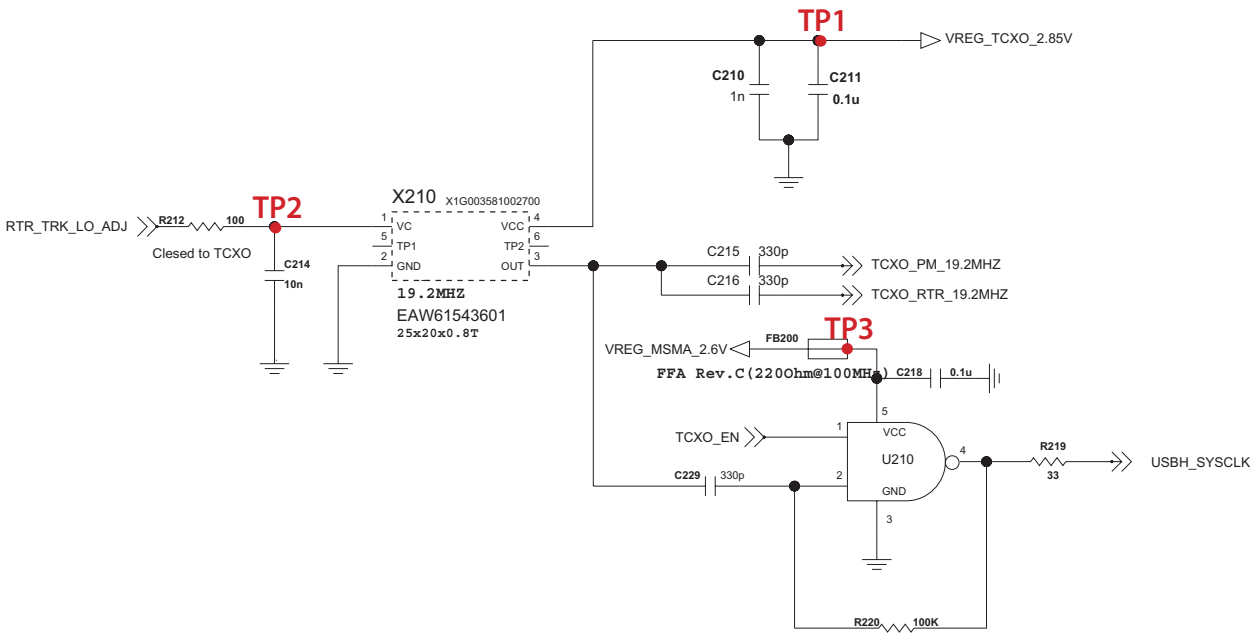
D. COMMON TX/RX PATH

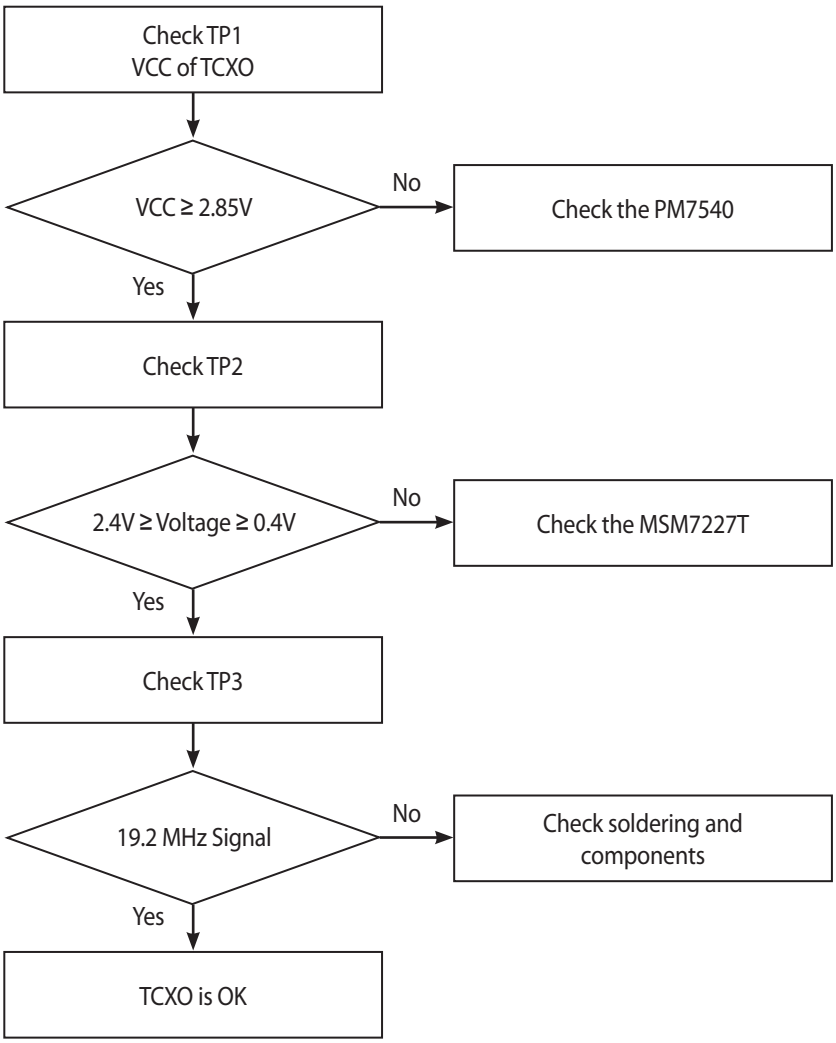
4.3 Checking TCXO Block

The output frequency (19.2MHz) of TCXO (X210) is used as the reference one of RTR6285 and PM7540 internal VCO.

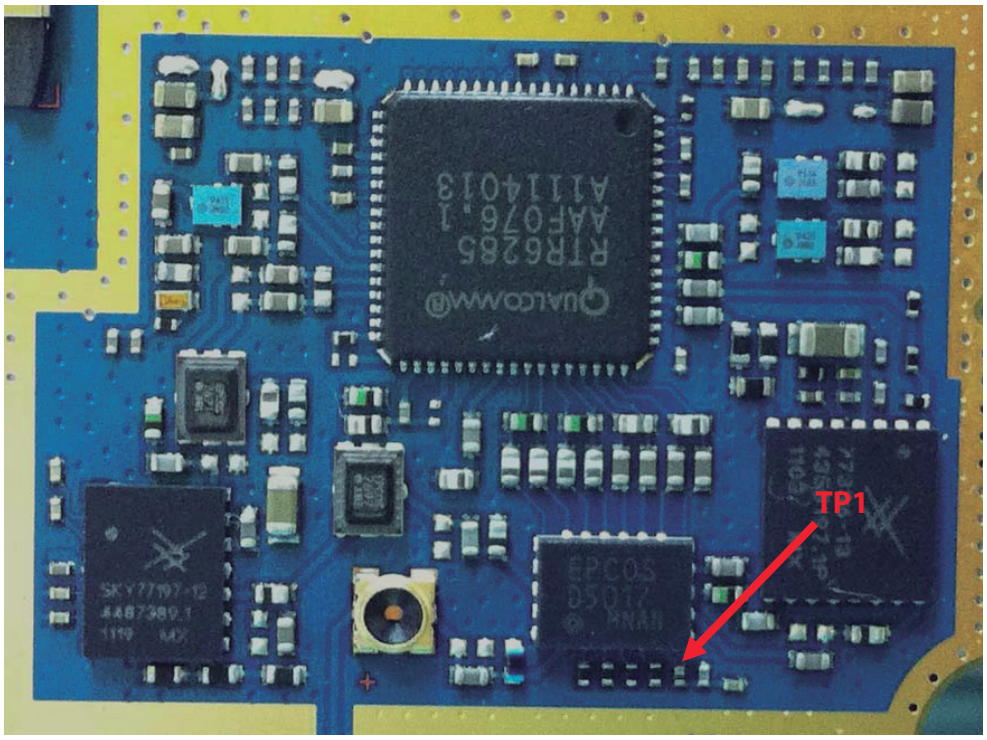


Schematic of the Crystal Part(19.2MHz)

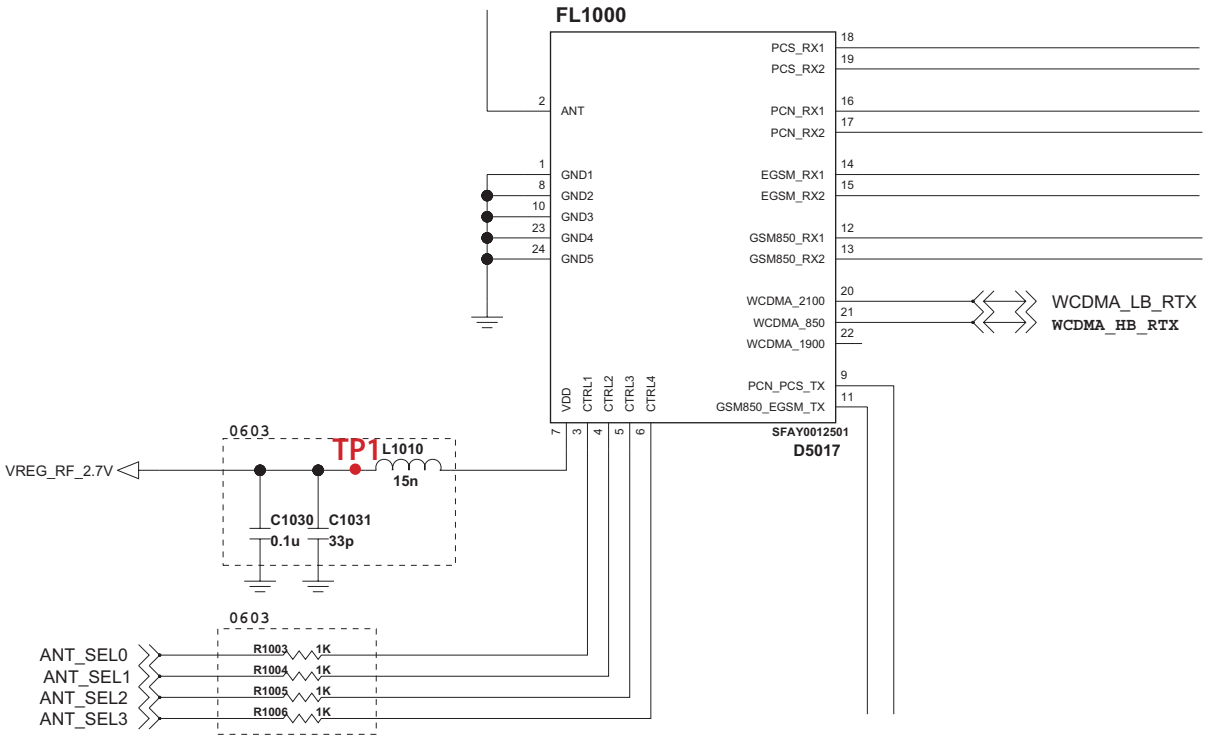




4.4 Checking FEM Block

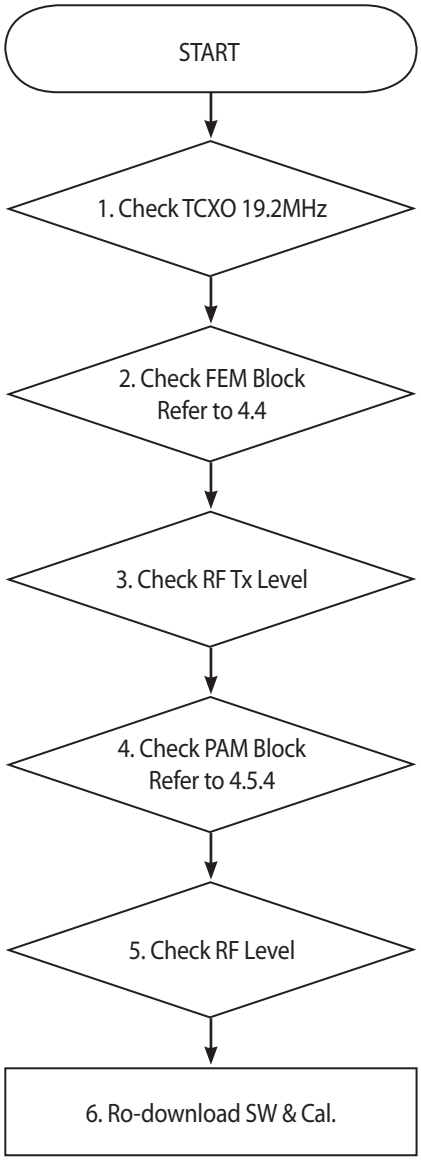


Schematic of the FEM block



Check the VREG_RF_2.7V level.

4.5 Checking WCDMA Block



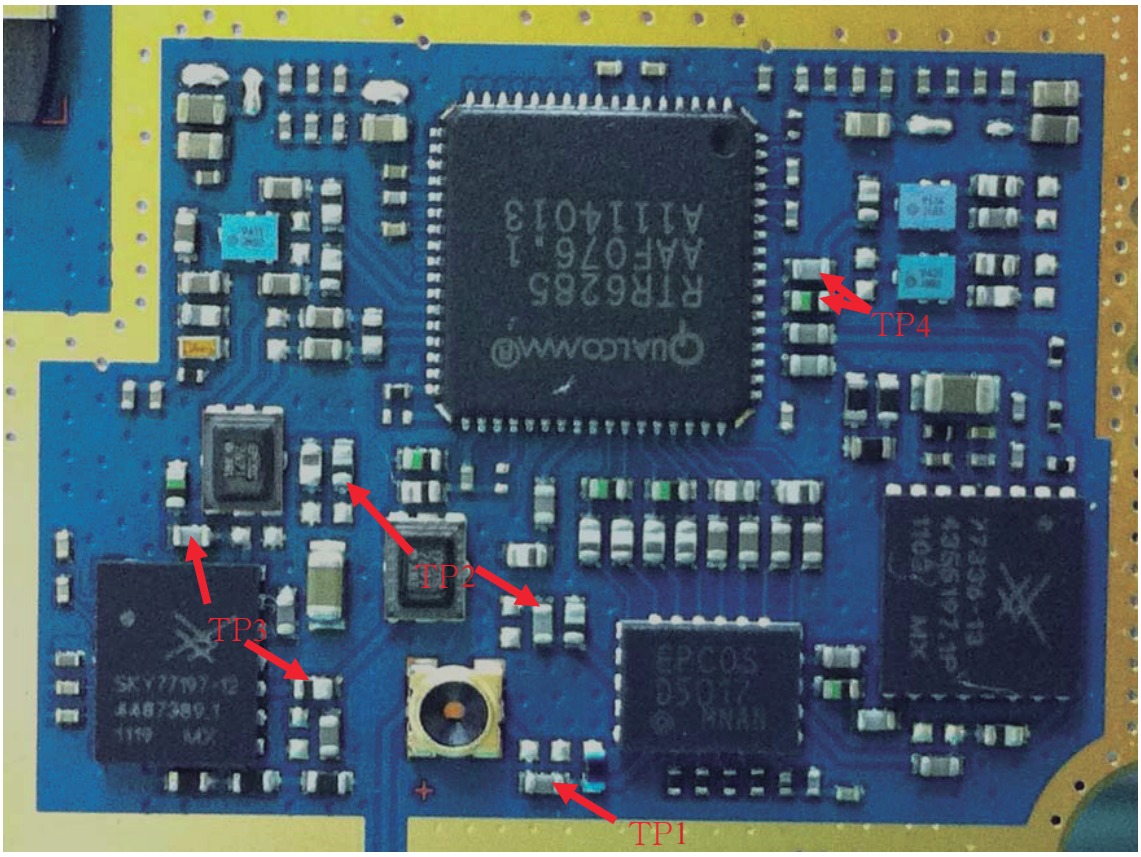
4.5.1Checking TCXO Block

Refer to 4.3

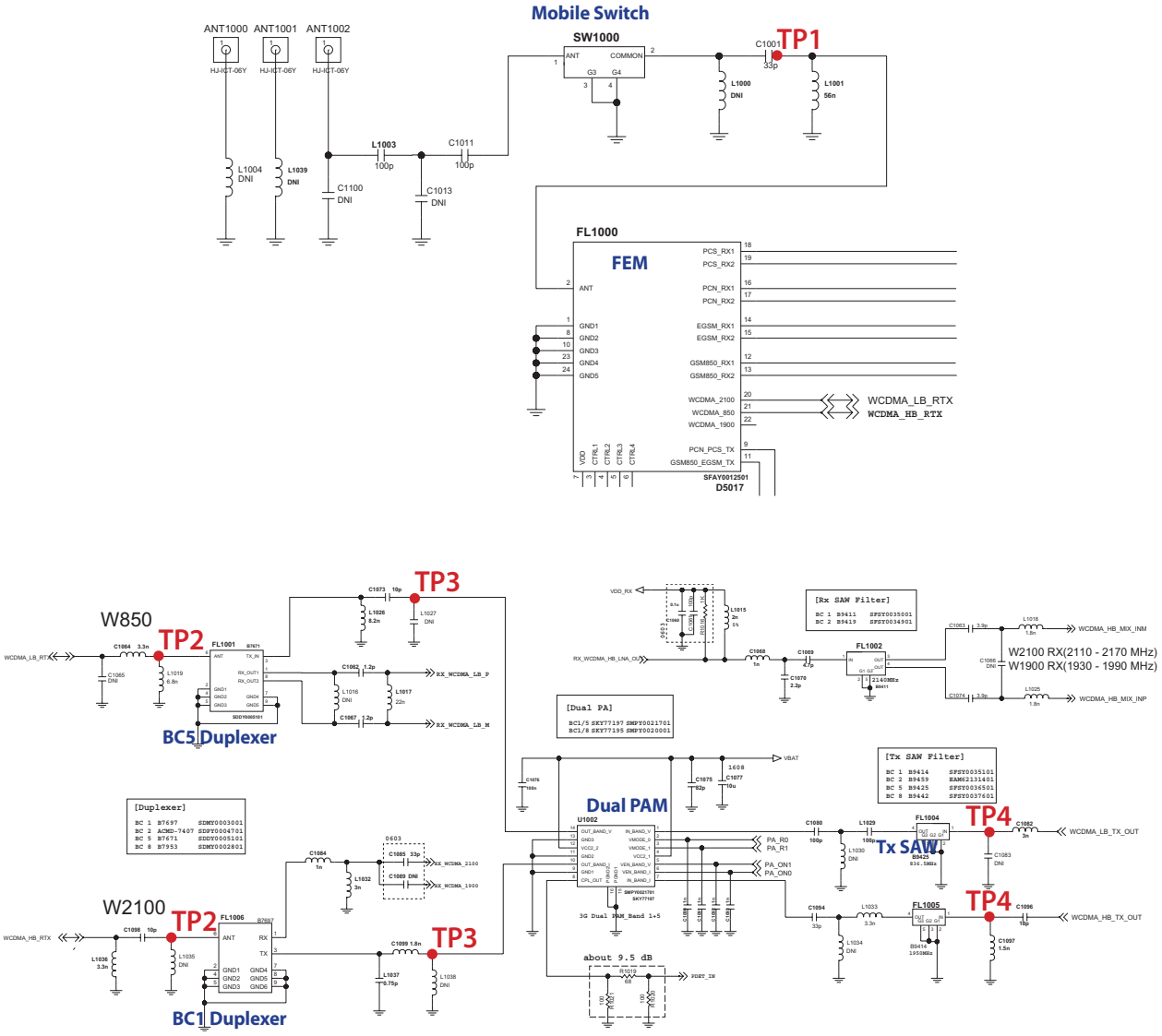
4.5.2. Checking FEM Block

Refer to 4.4

4.5.3. Checking RF TX Level

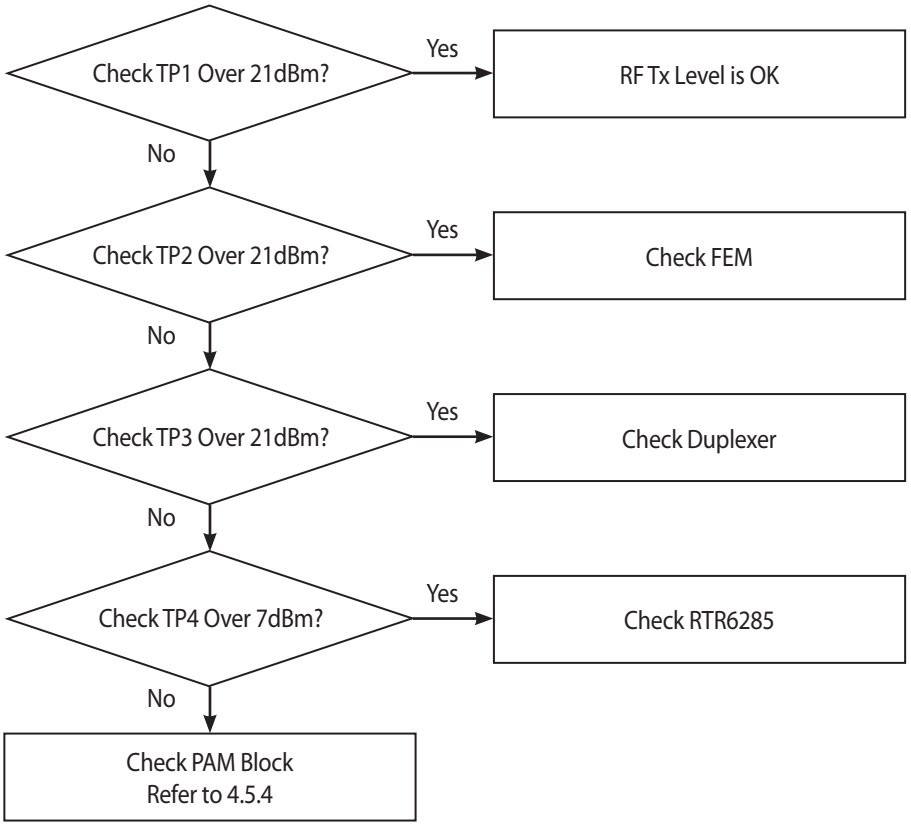


Test Point (TX Level)



Schematic of the WCDMA block

For testing, Max power output is needed.



RTR6285 Maximum output Power = 7 dBm
RTR6285 minimum output Power = -80 dBm
PAM(SKY77195) = Maximum input Power = 10 dBm

4.5.4. Checking PAM Block

PAM control signal

W_PA_ON (W_850_PA_ON(C1092), W_2100_PA_ON(C1093) and) : PAM Enable

W_PA_RO: PAM Gain Control

W_PA_ON must be HIGH (over 2.6V)

[SKY77197 Mode operation Table]

Table 3. Modes of Operation

Power Setting		Band	$V_{EN\_BAND\_I}$	$V_{EN\_BAND\_VIII}$	V_{MODE0}	V_{MODE1}	V_{CC}
Power Down Mode		—	Low	Low	Low	Low	On
Standby Mode		—	Low	Low	X	X	On
Low Power Mode	($P_{OUT} \leq$ 7 dBm)	I	High	Low	High	High	On
Mid Power Mode	(P_{OUT} = 7 dBm to 18 dBm)	I	High	Low	High	Low	On
High Power Mode	(P_{OUT} = 18 dBm to P_{MAX})	I	High	Low	Low	Low	On
Optional Lower Vcc	($P_{OUT} \leq$ 7 dBm)	I	High	Low	Low	Low	TBD
Low Power Mode	($P_{OUT} \leq$ 7 dBm)	VIII	Low	High	High	High	On
Mid Power Mode	(P_{OUT} = 7 dBm to 18 dBm)	VIII	Low	High	High	Low	On
High Power Mode	(P_{OUT} = 18 dBm to P_{MAX})	VIII	Low	High	Low	Low	On
Optional Lower Vcc	($P_{OUT} \leq$ 7 dBm)	VIII	Low	High	Low	Low	TBD

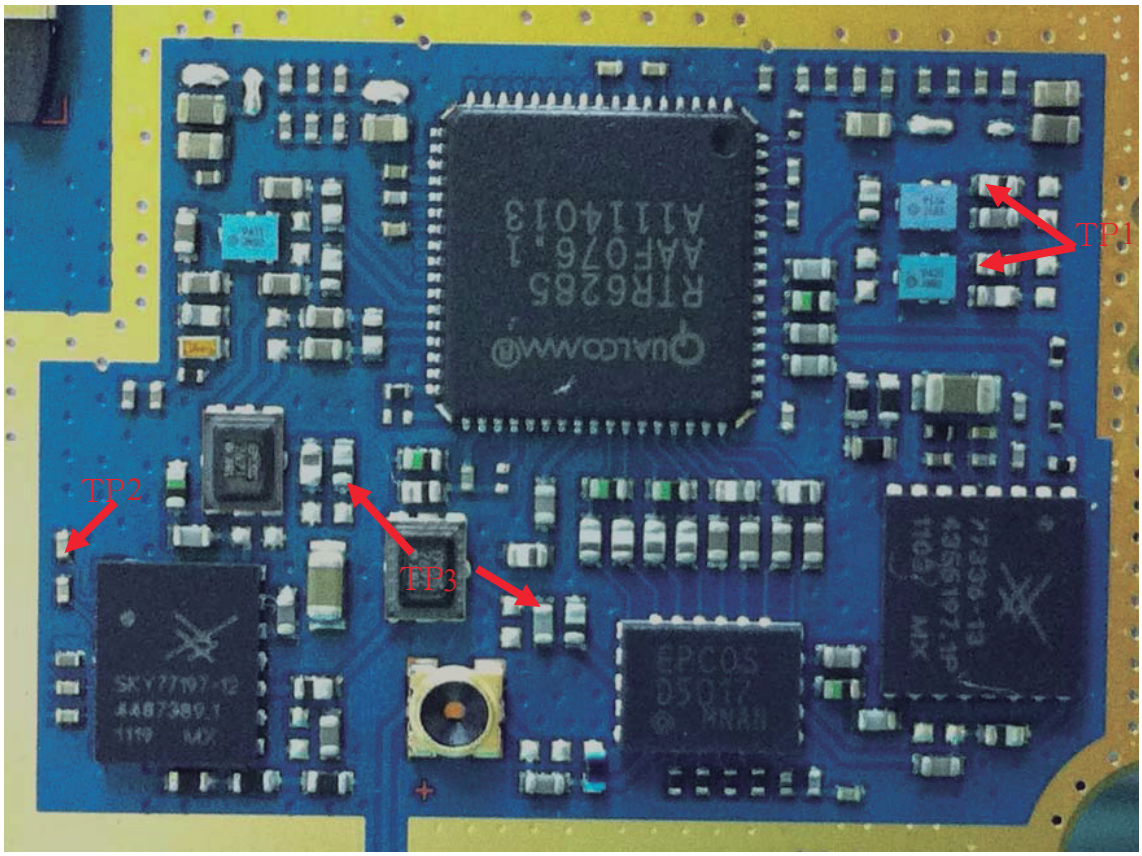
PAM IN/OUT Signal :

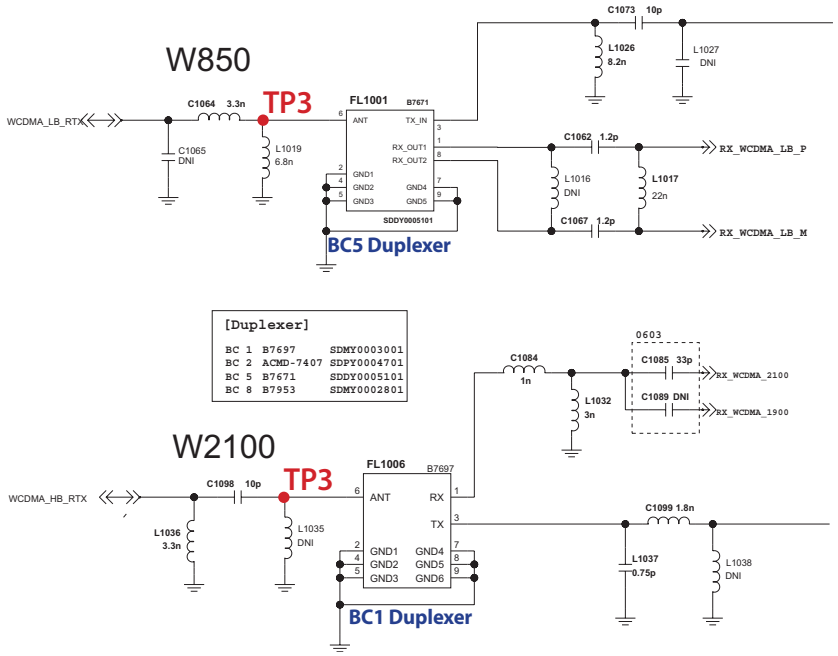
When PAM is under the operation of high power mode

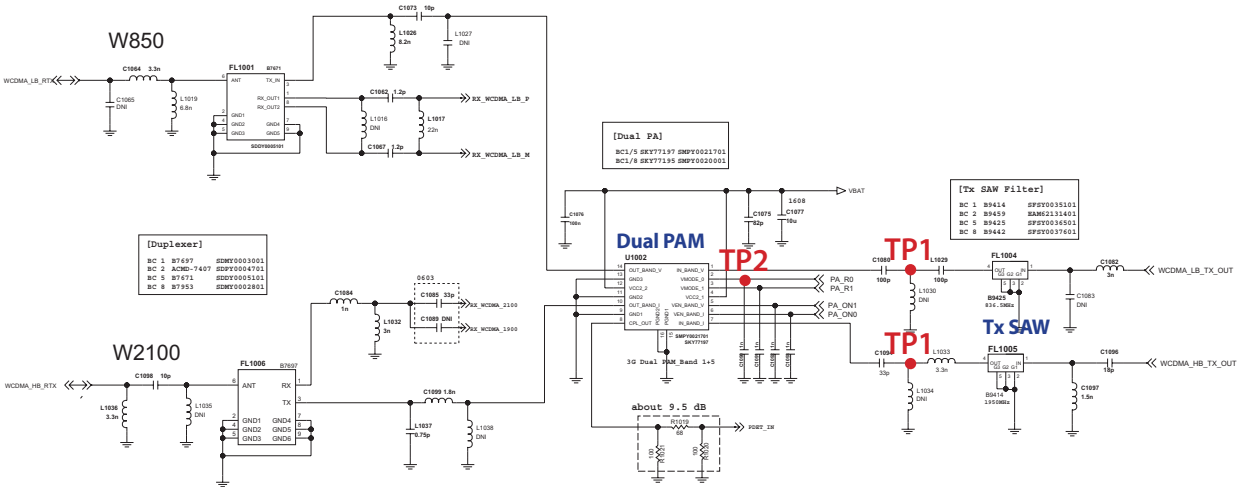
(PA_R0(C1090):Low)

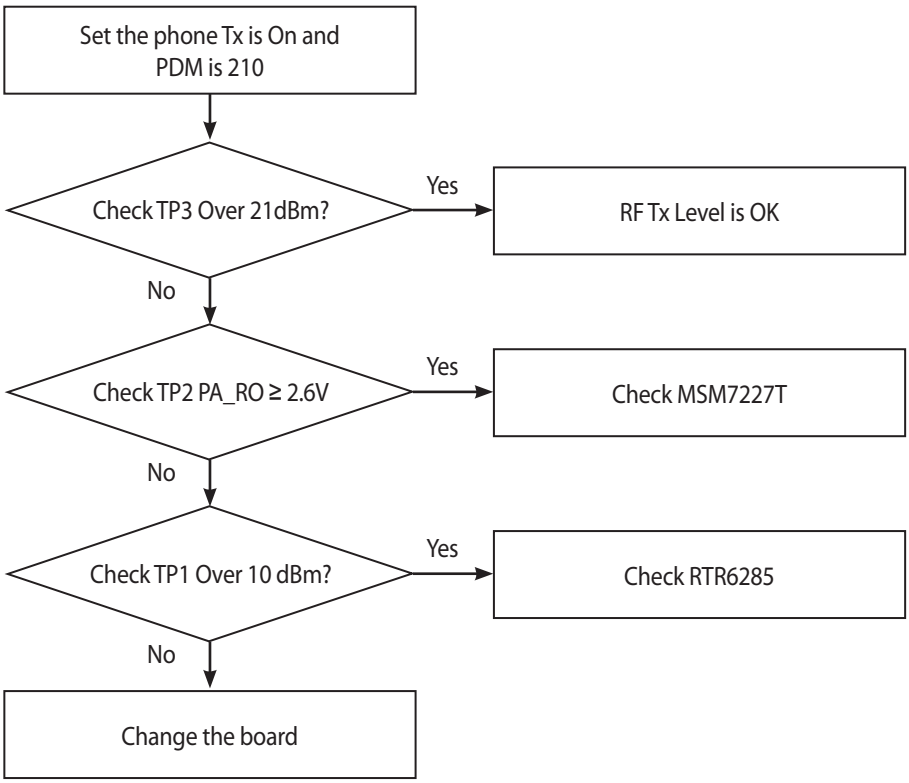
PAM OUT power must be over 21 dBm

PAM IN power must be under 10 dBm

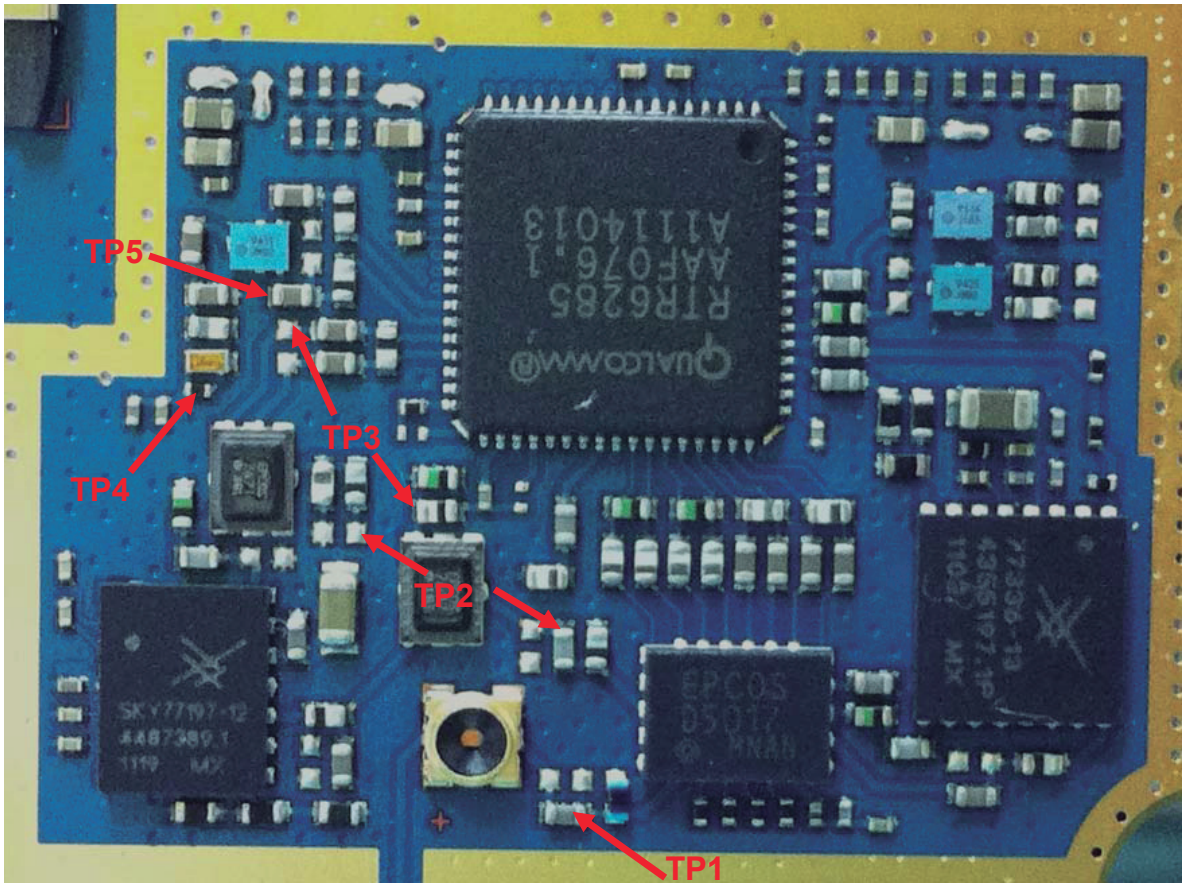




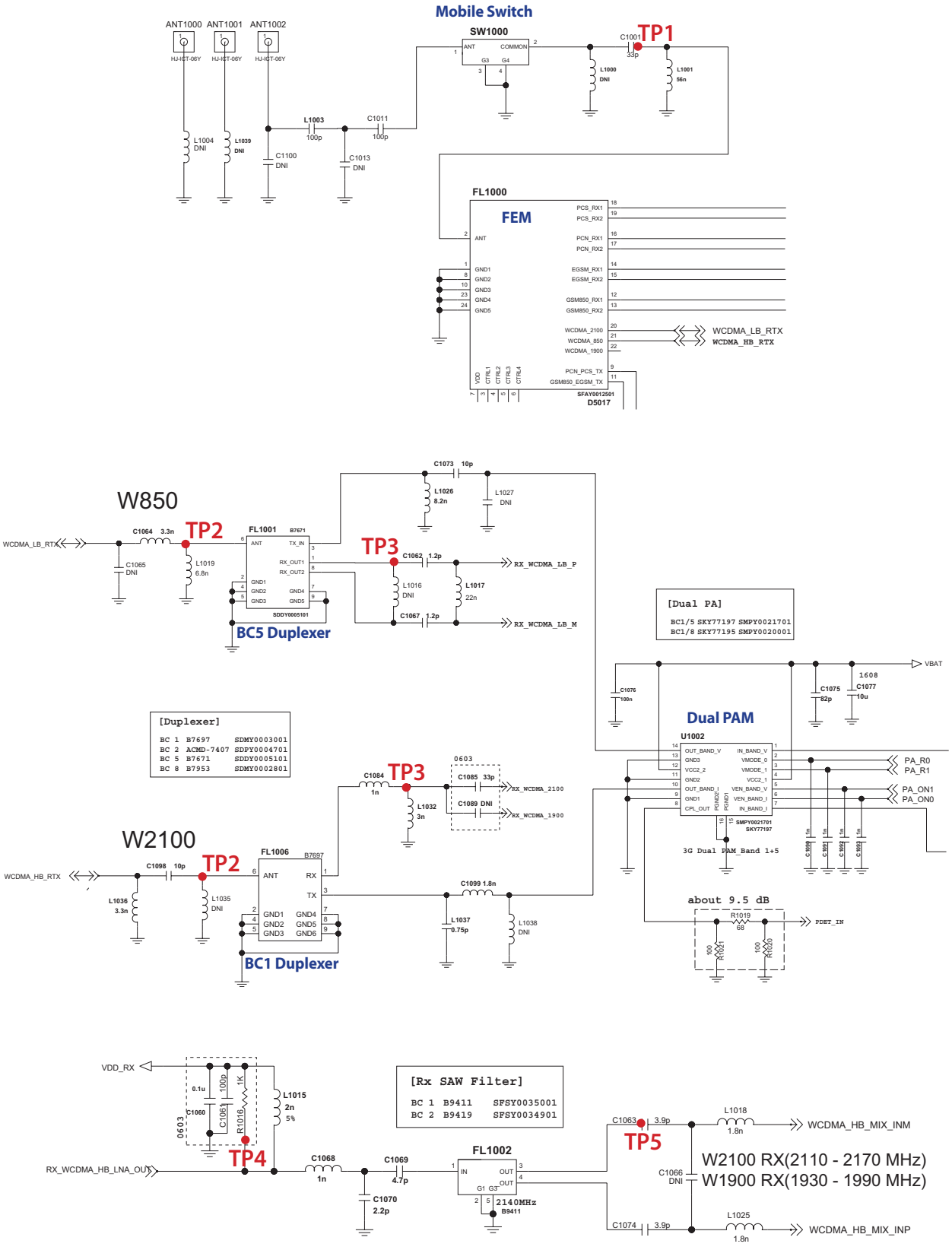


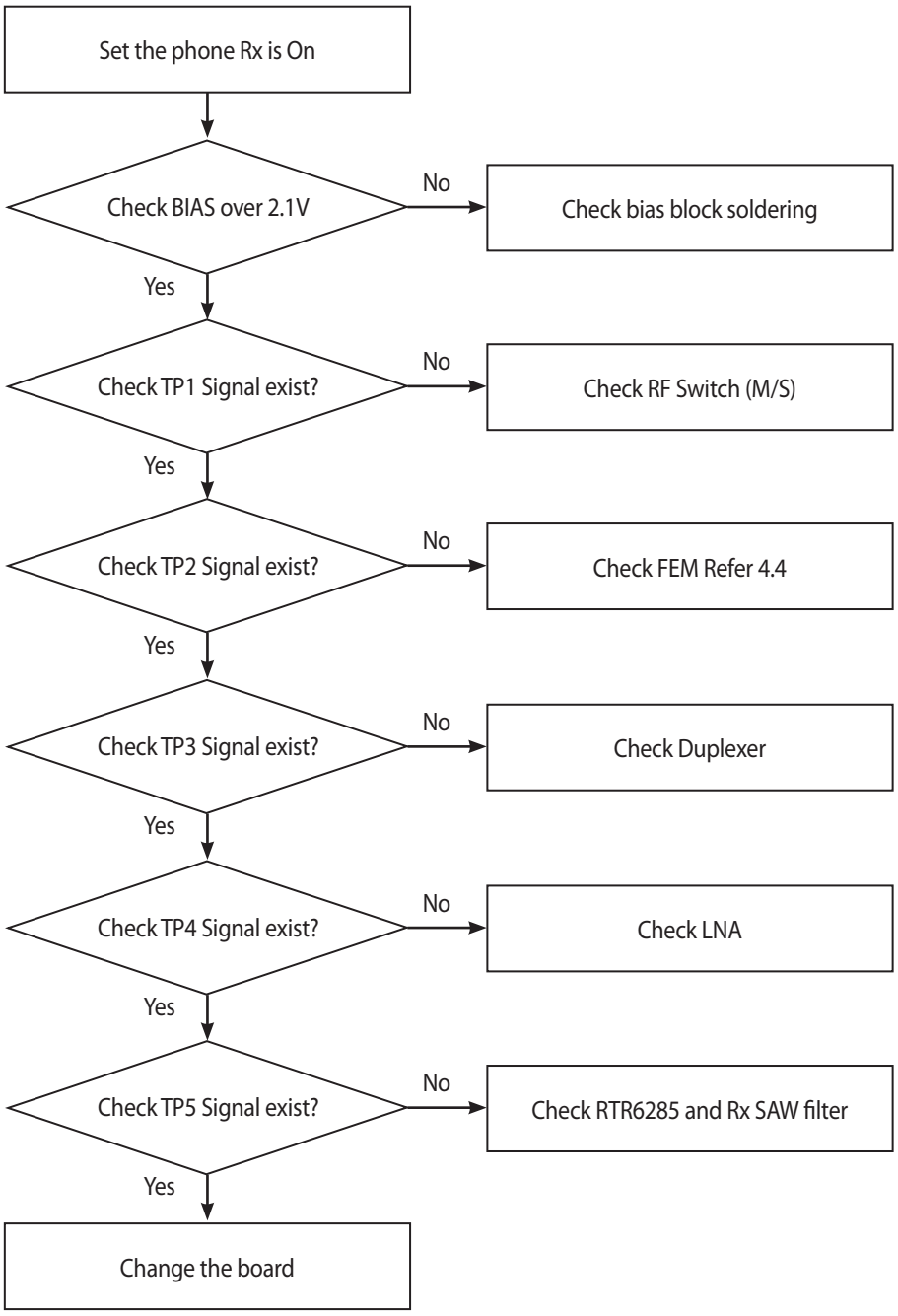


4.5.5. Checking RF Rx Level

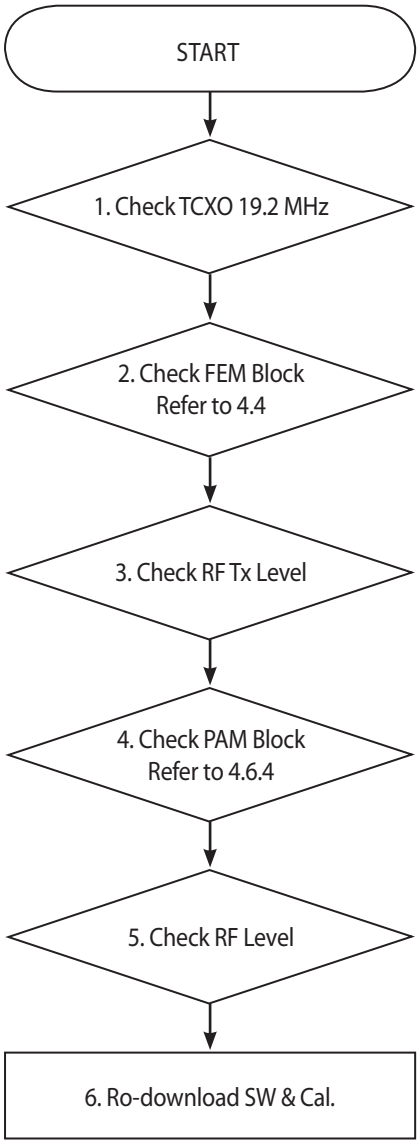


Test Point (RF Rx Level)





4.6 Checking GSM Block



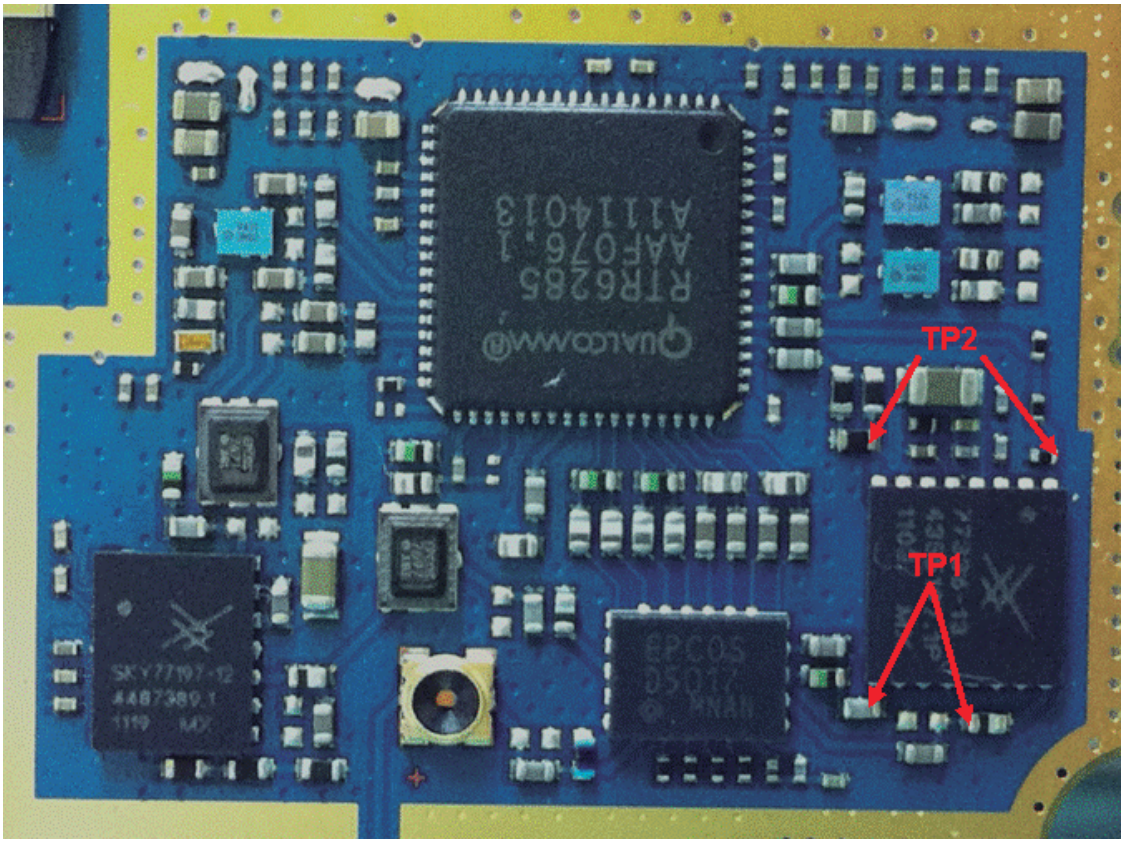
4.6.1 Checking TCXO Block

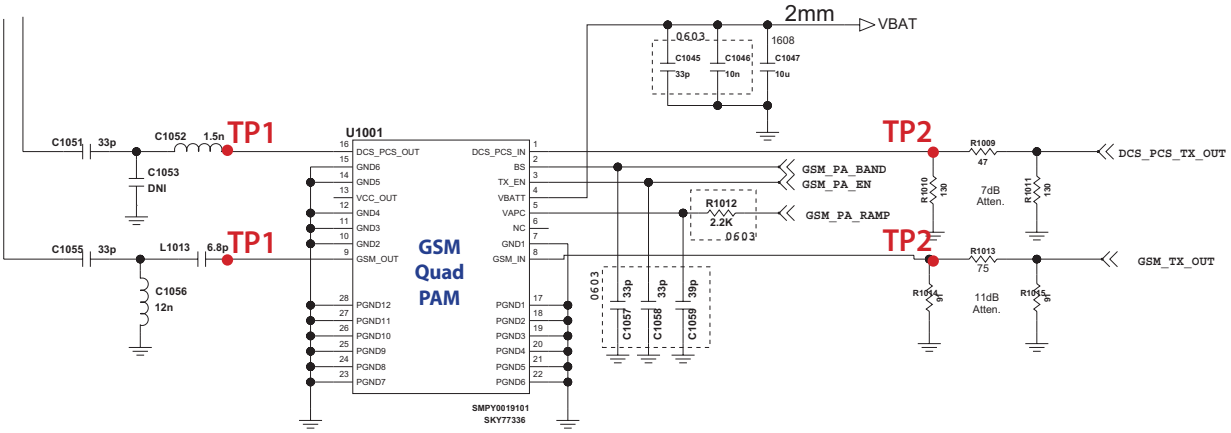
Refer to 4.3

4.6.2 Checking FEM Block

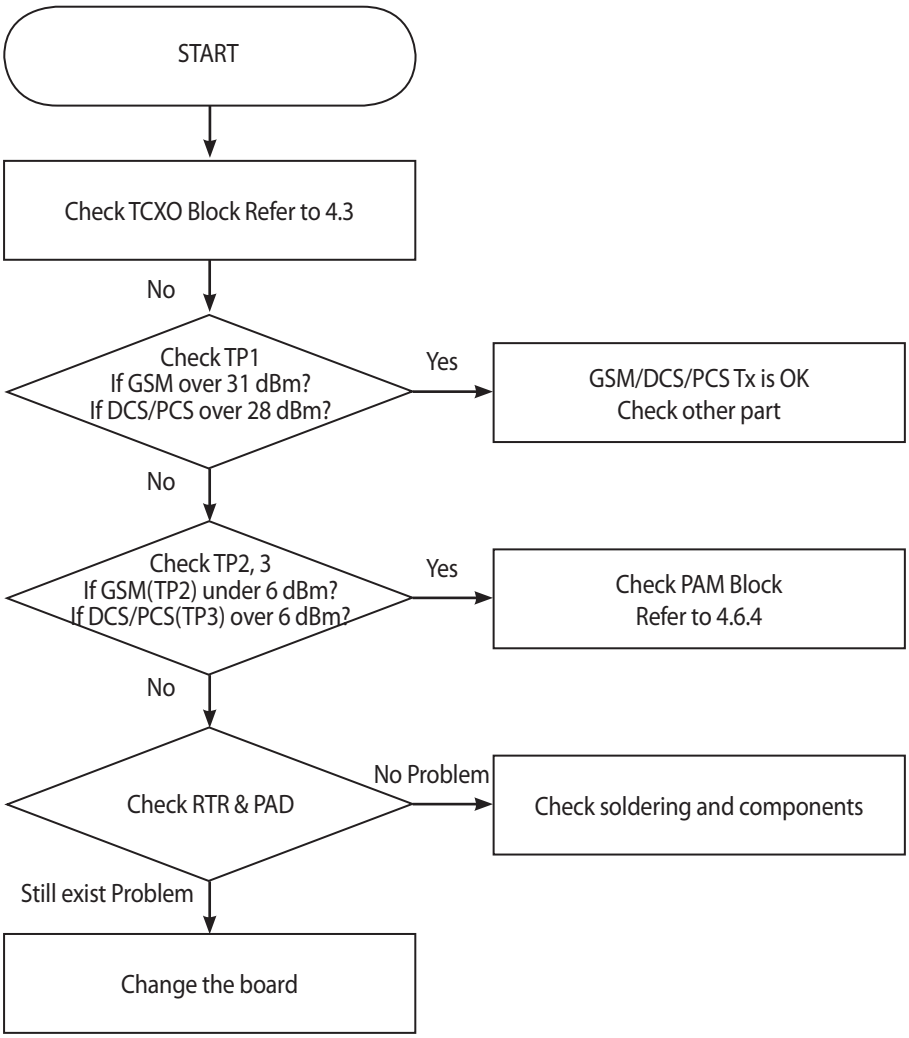
Refer to 4.4

4.6.3 Checking RF TX level

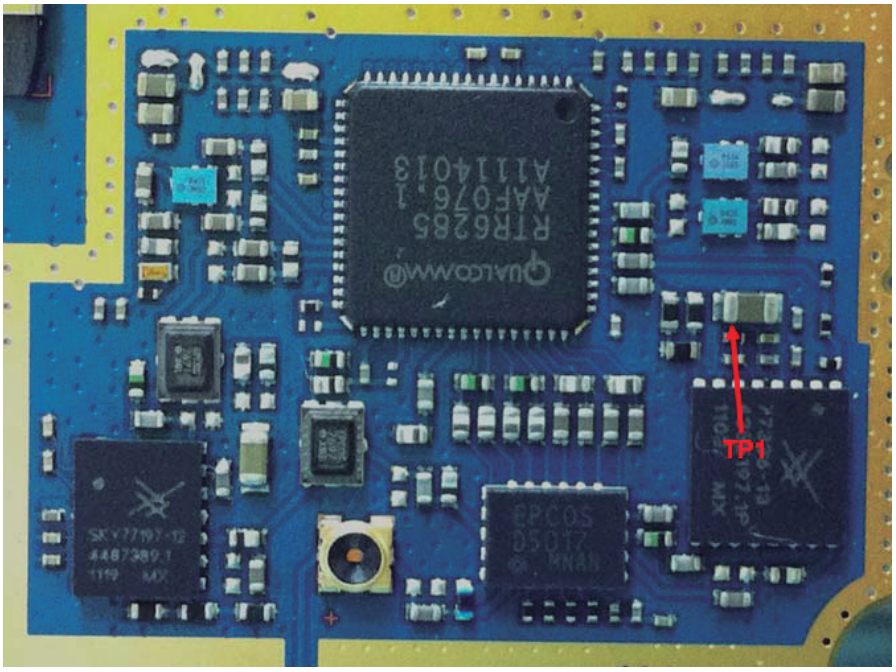


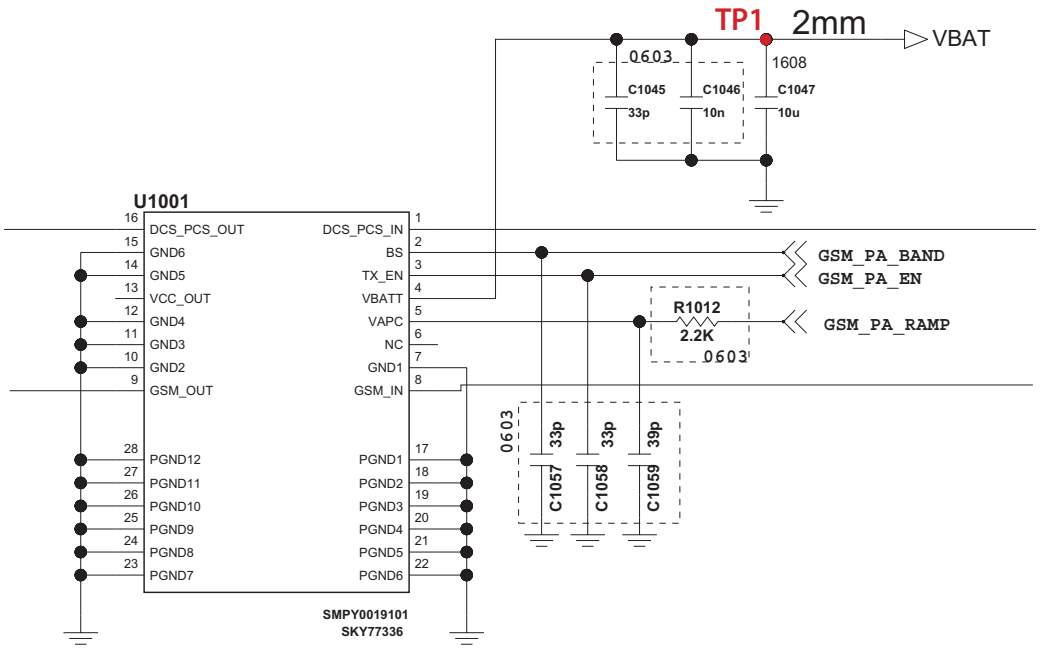


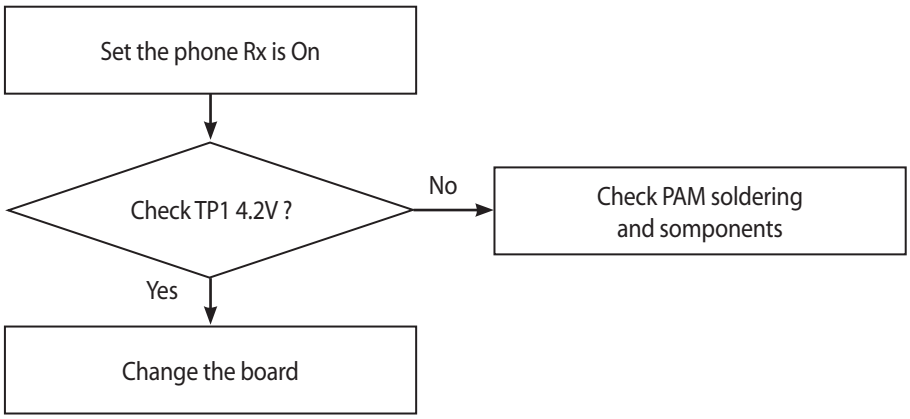
Schematic of GSM/DCS/PCS Tx Block



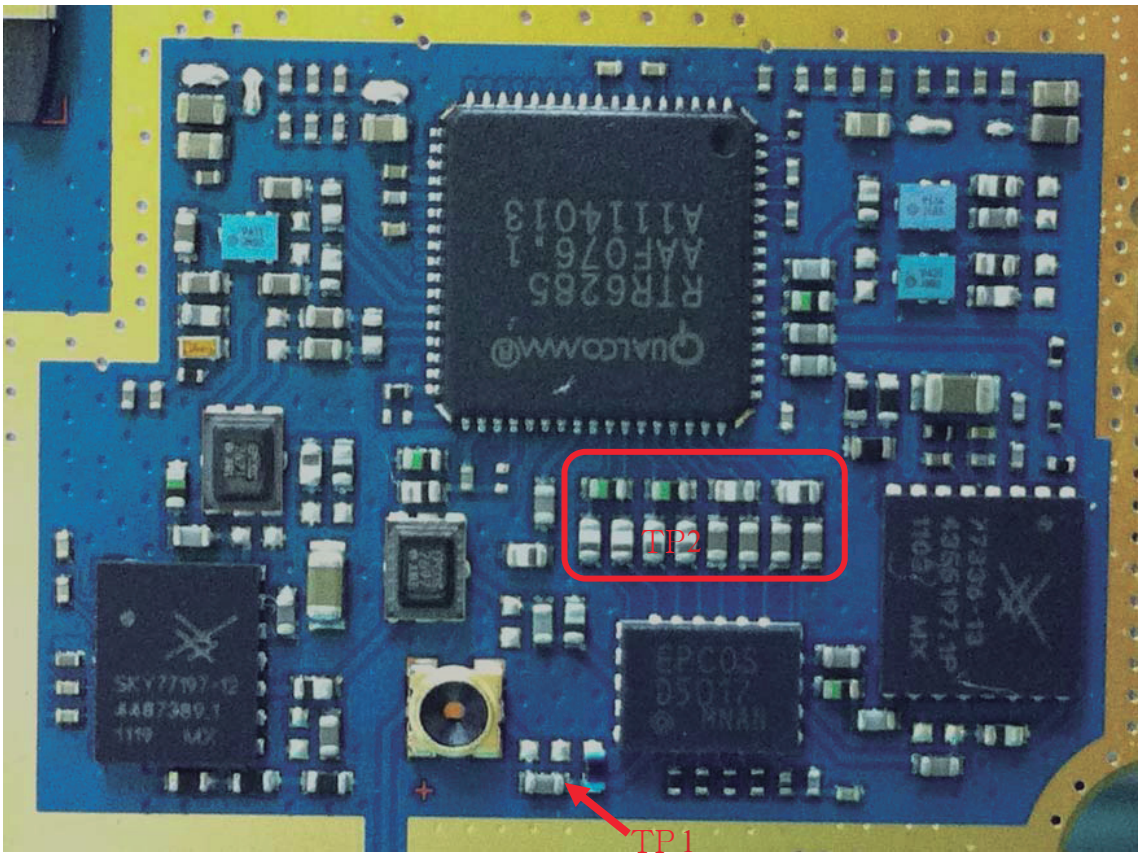
4.6.4 Checking PAM Block



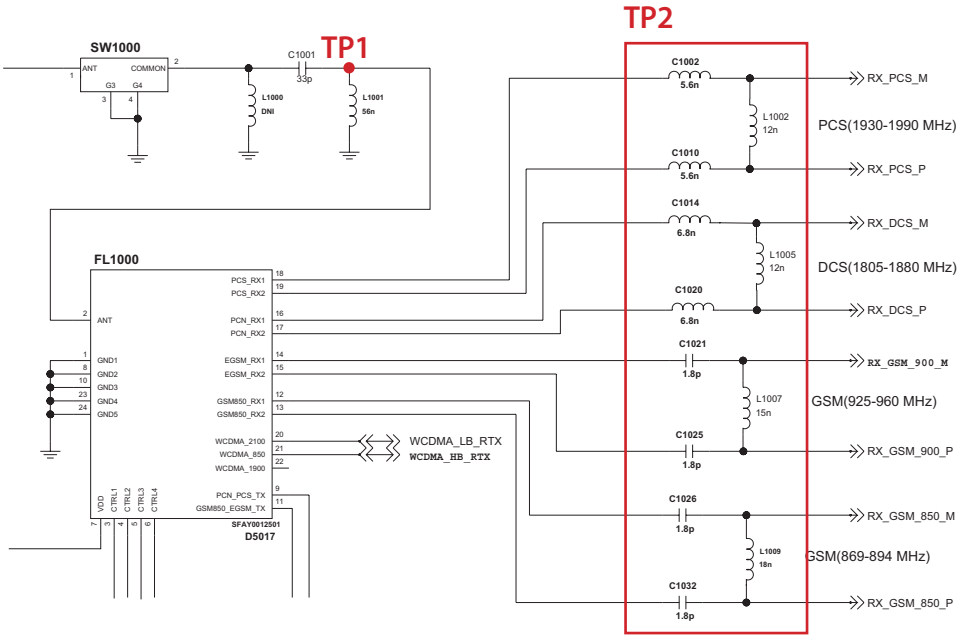


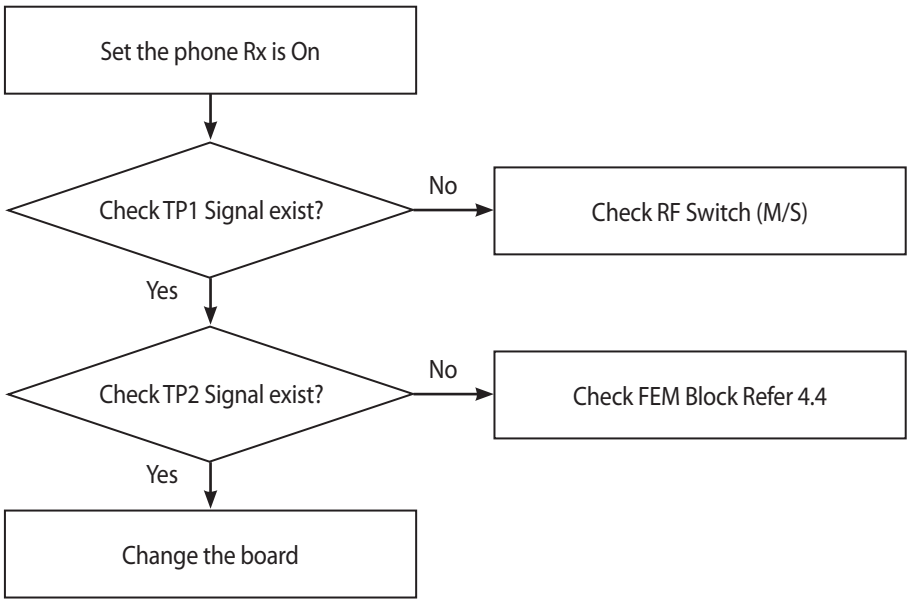


4.6.5 Checking RF Rx Block

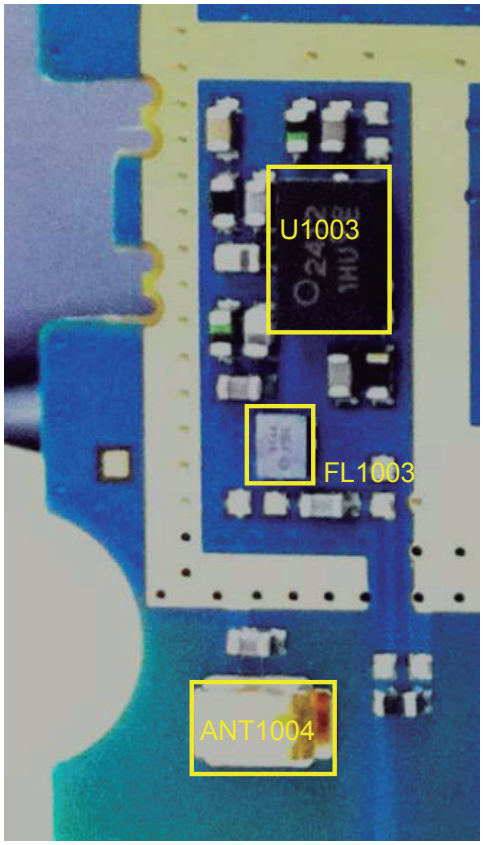


Schematic of GSM/DCS/PCS Rx Block



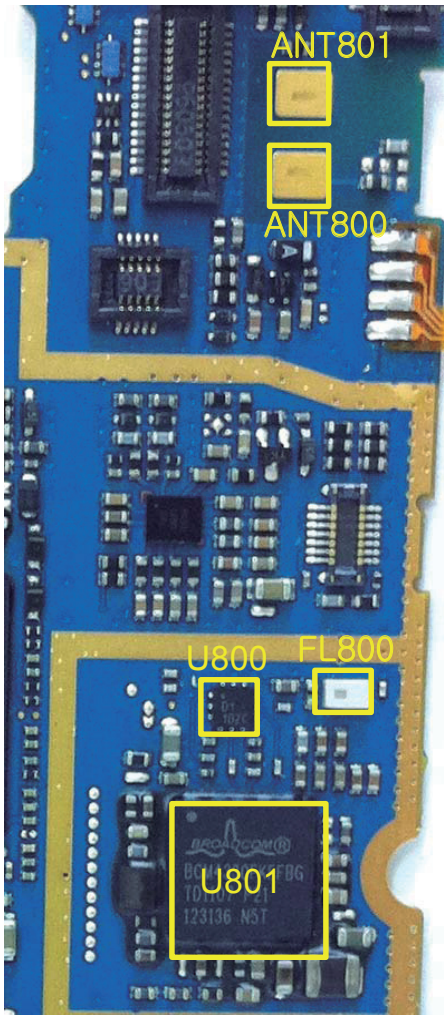


4.7 GPS/WIFI/BT RF Component



RF Component(GPS)

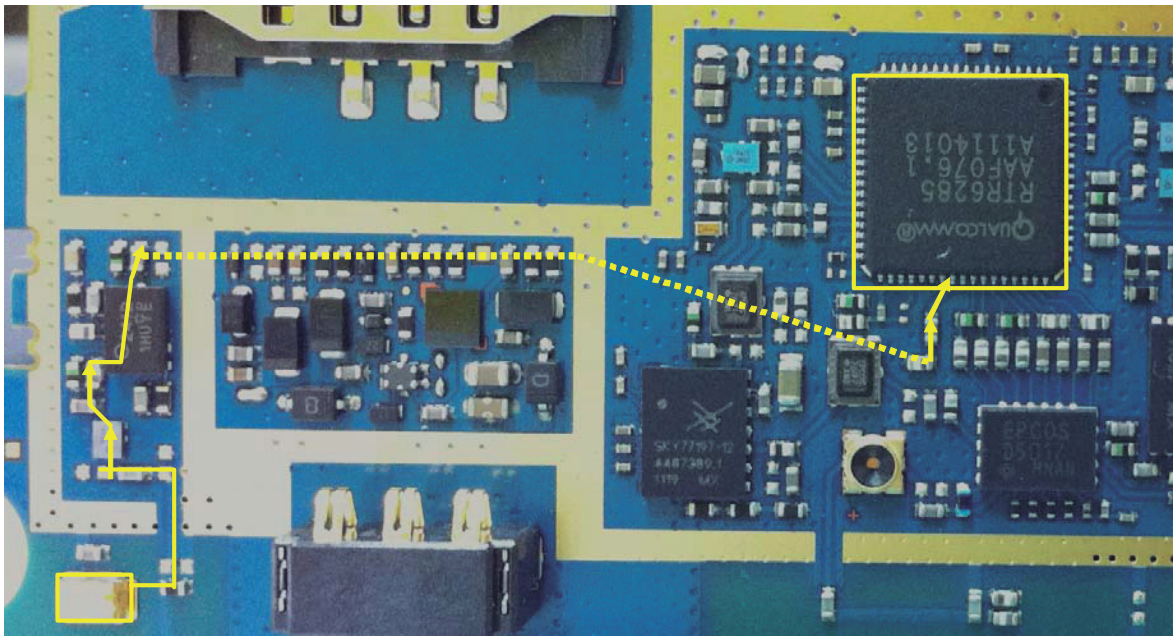
Reference	Description
U1003	GPS LNA Module
FL1003	GPS SAW Filter
ANT1004	ANT pad



RF component (WiFi / BT)

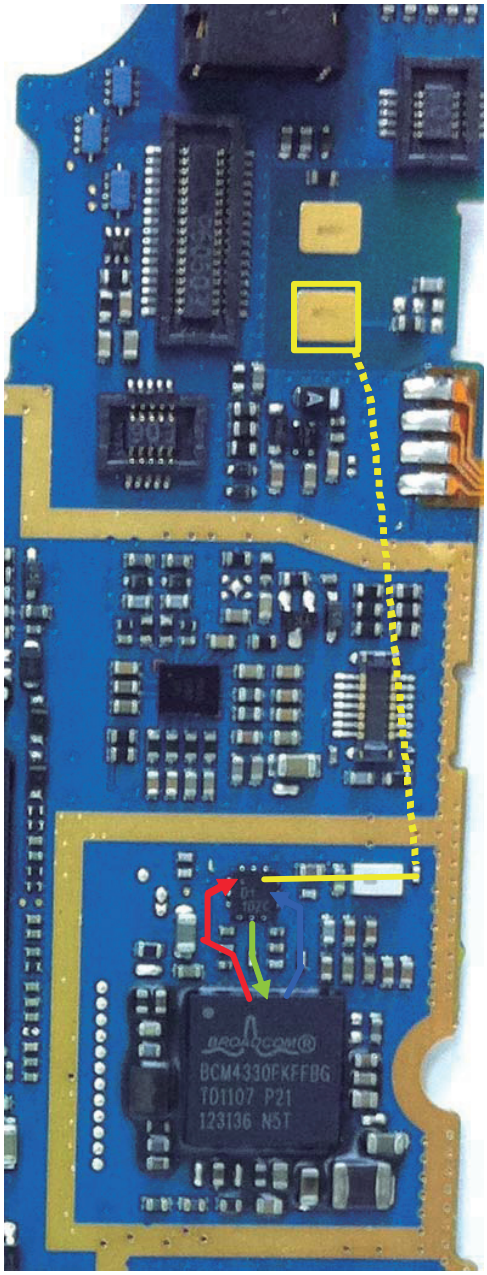
Reference	Description
ANT800	ANTENNA PAD connected to Carrier type antenna
ANT801	GND PAD
U801	WiFi / BT /FM module
U800	BT_WIFI Switch
FL800	BT_WIFI_2.4GHz SAW

4.8 GPS/WIFI/BT SIGNAL PATH



GPS Signal PATH (main board bottom)

4.9 GPS/WIFI/BT Trouble shooting



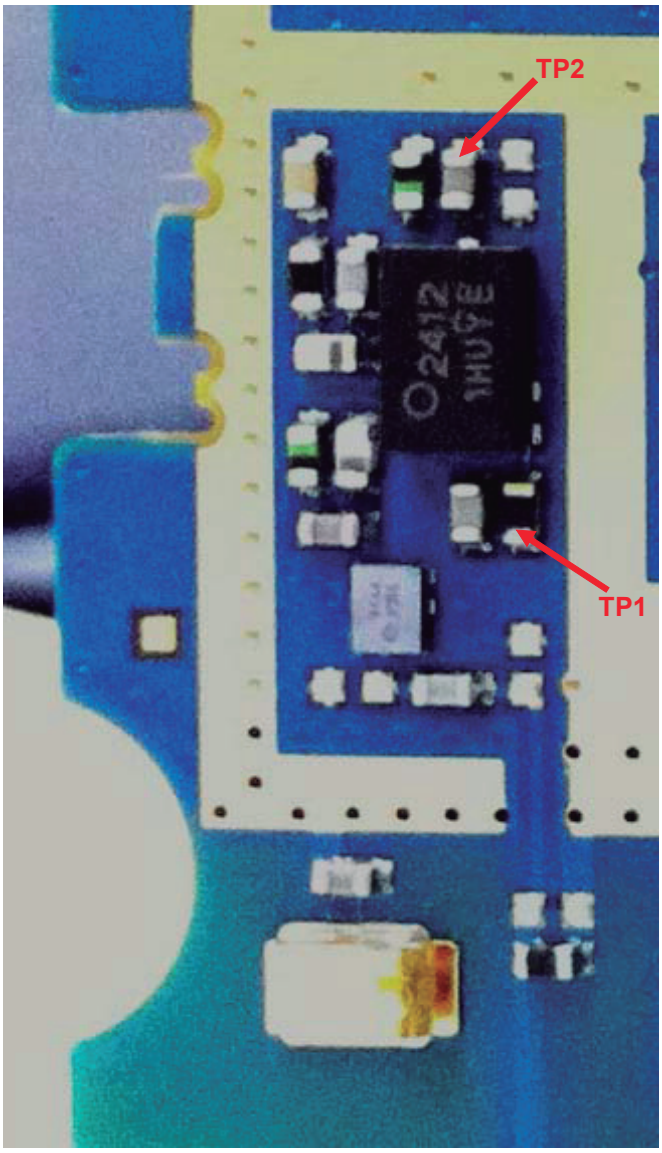
WiFi / BT Signal PATH

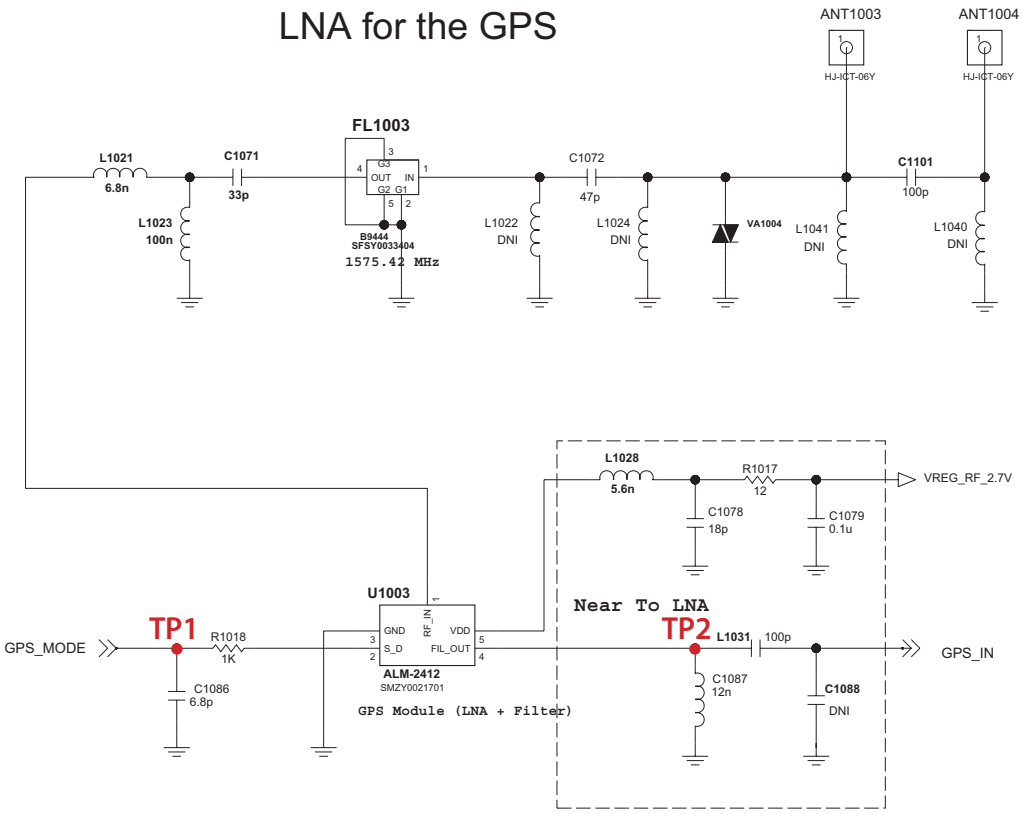
WIFI BT common T/Rx path

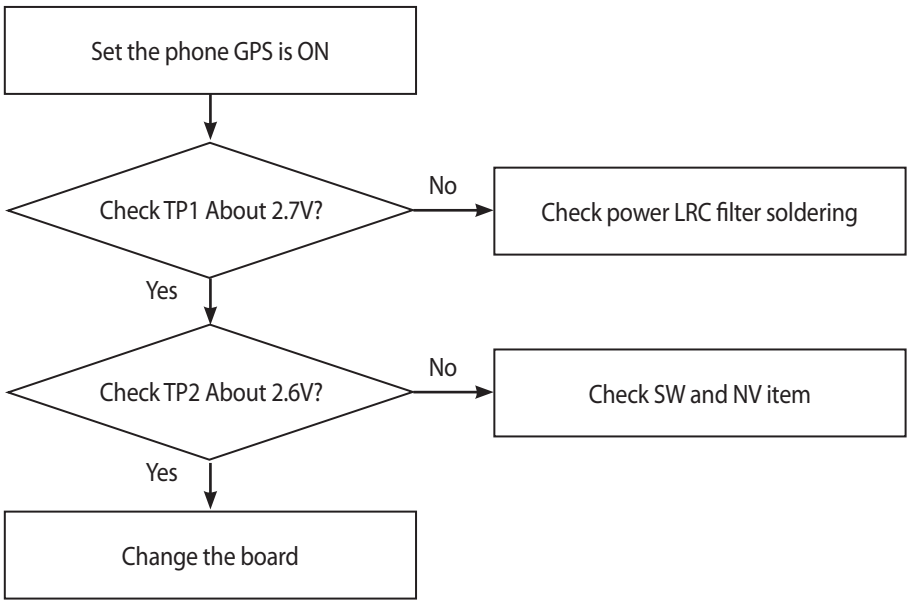
WIFI BT common Rx path

BT Tx Path

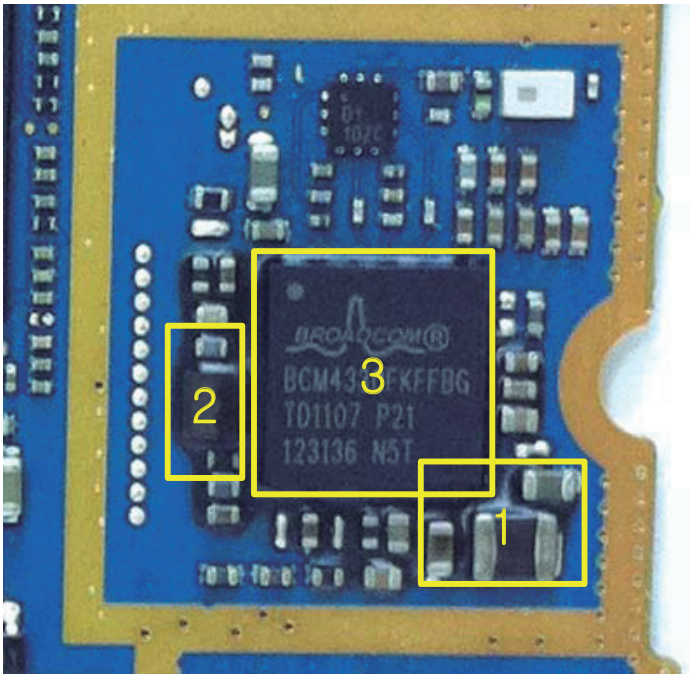
4.9.1 A-GPS Block

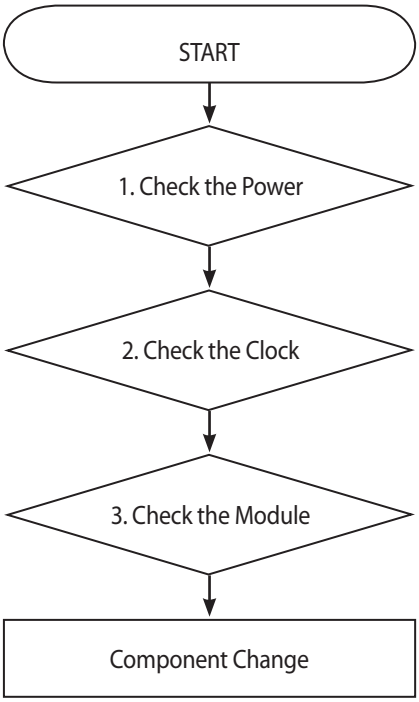


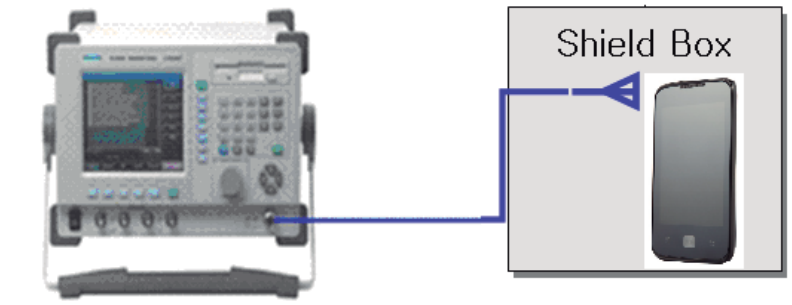




4.9.2 WLAN/BT/FM Block







TC-3000A (Bluetooth Tester)

- Bluetooth RF Test procedure

1. Set phone to Bluetooth test-mode.

- Blue tooth ON: Enter Test Mode(3845#*510#) →WCDMA-Only → Module test → BT DUT → DUT Mode

2. Insert a phone in a TEMCELL (in case of radiation test)

3. Set 'discover' after push menu button of the tester and select the link analyzer.

4. After 'set test mode', confirm the connection state.

5. Measure the power of full channel after hopping mode is selected to 'ON'

6. You can select wanted test cases after getting an optimized power

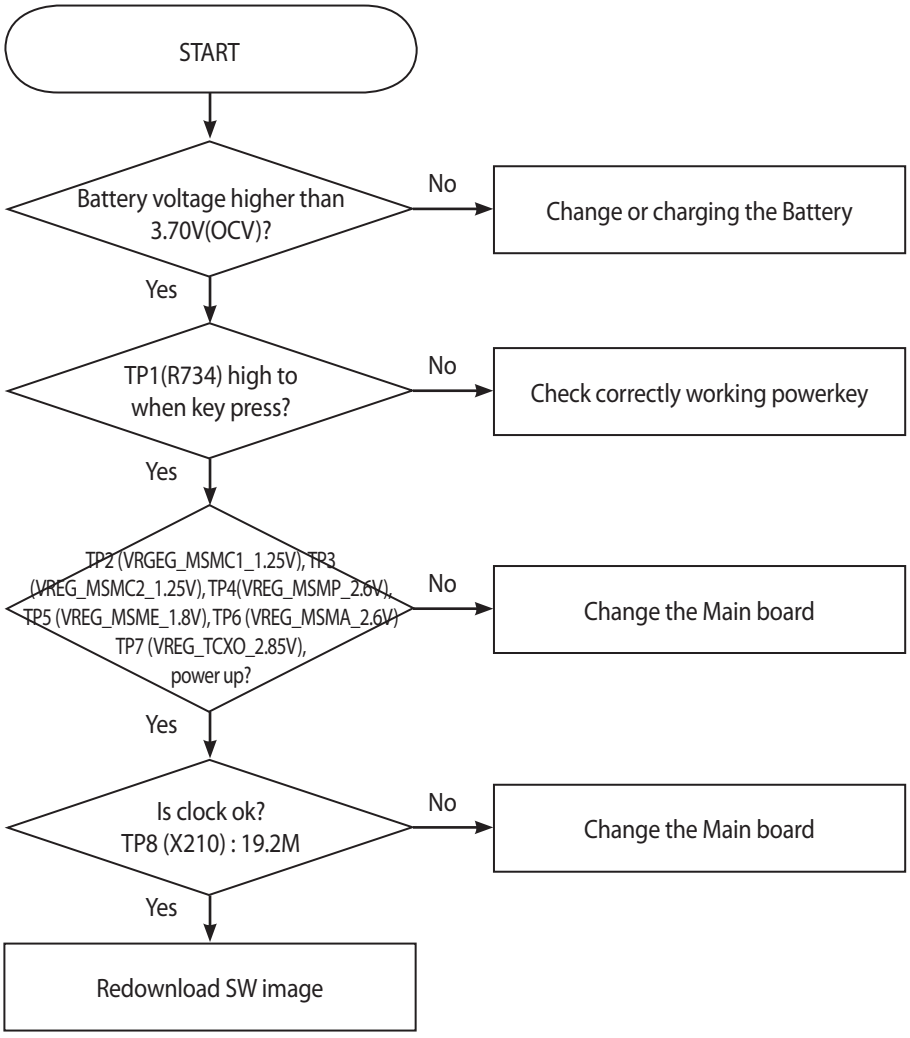
7. Blue tooth On/Off

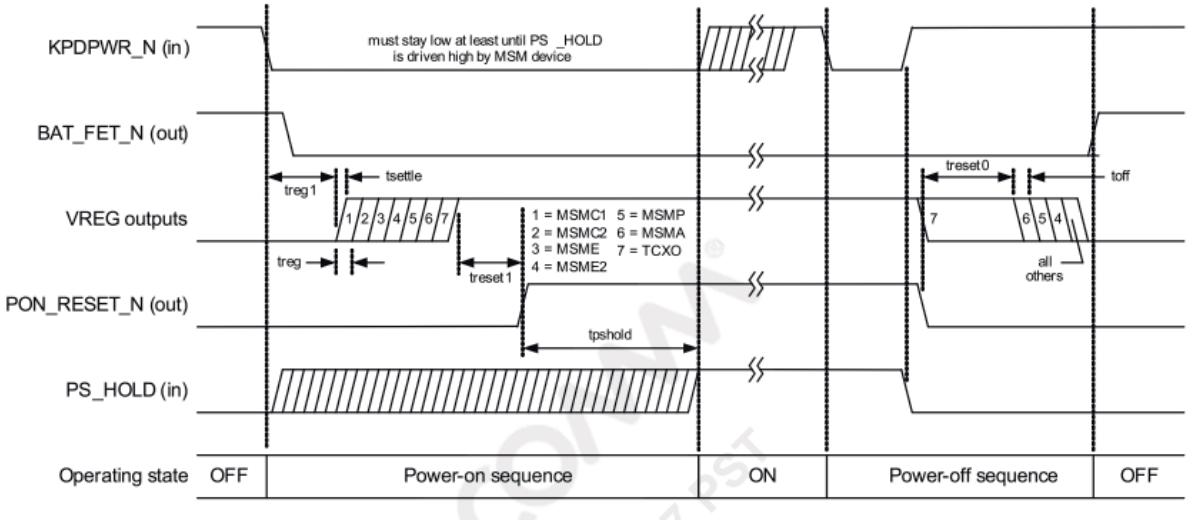
- Menu Key→settings→Wireless controls→Bluetooth→Turn on/Turn off

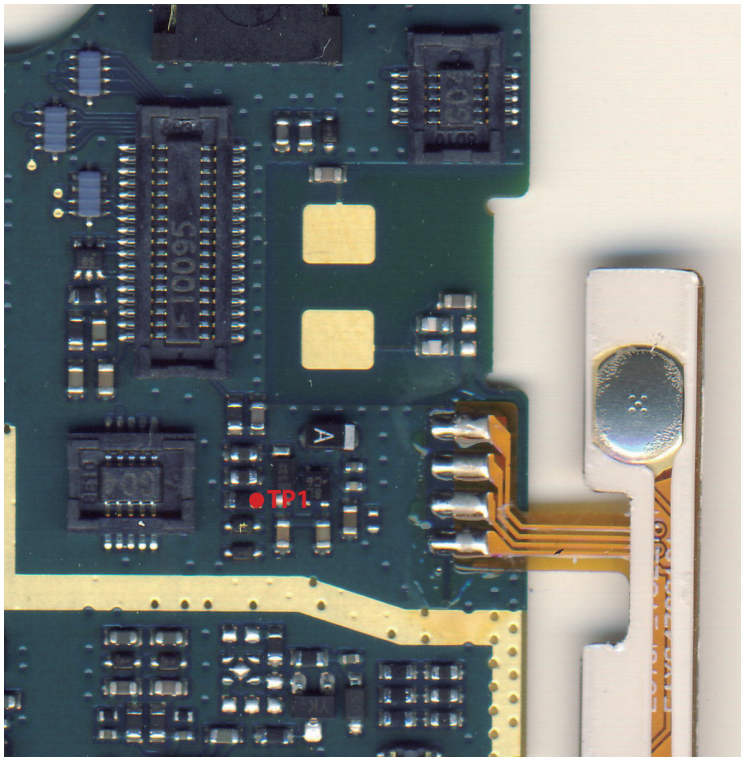
4.10 Power ON Trouble Shooting

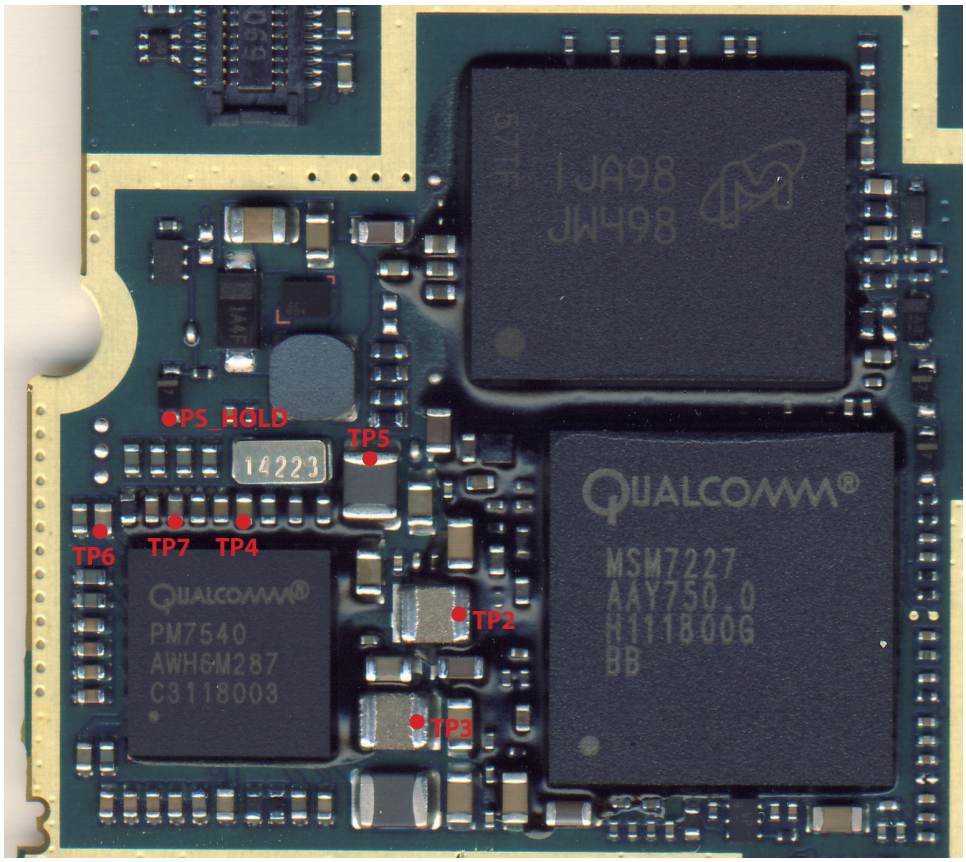
Power On sequence of E510 is :

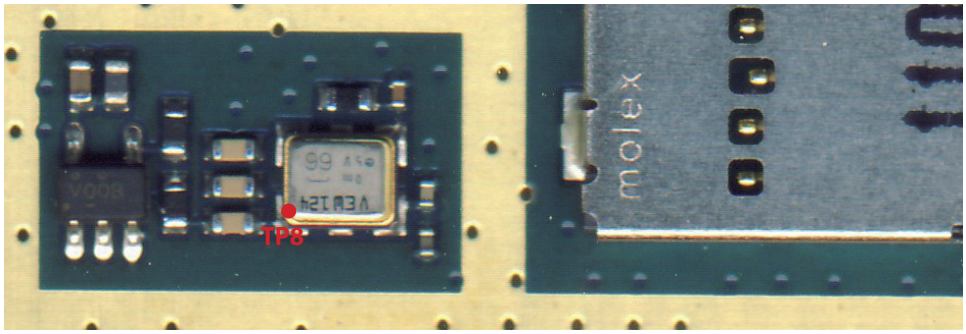
Power key press → KPD_PWR_N go to low → PM7540 Power Up → VREG_MSMC1_1.2V(C431), VREG_MSMC2_1.2V(C432), VREG_MSME_1.8V(C433), VREG_MSMP_2.7V(C454), VREG_MSMA_2.6V(C453), VREG_TCXO_2.85V(C458) power ON → Phone booting and PS_HOLD(D402) go to High



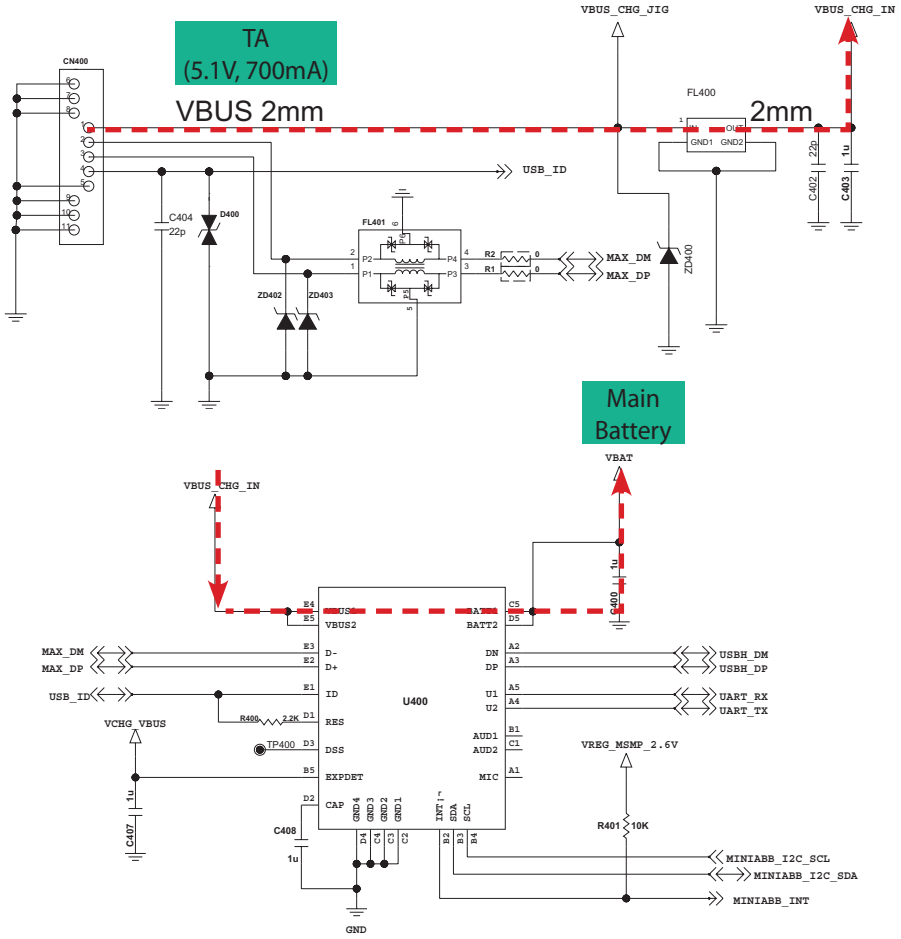








4.11 Charging Trouble Shooting



1. Charging Procedure

- Connect TA or u-USB Cable
- Control the charging current by RT8965 IC
- Charging current flows into the battery

2. Check Point

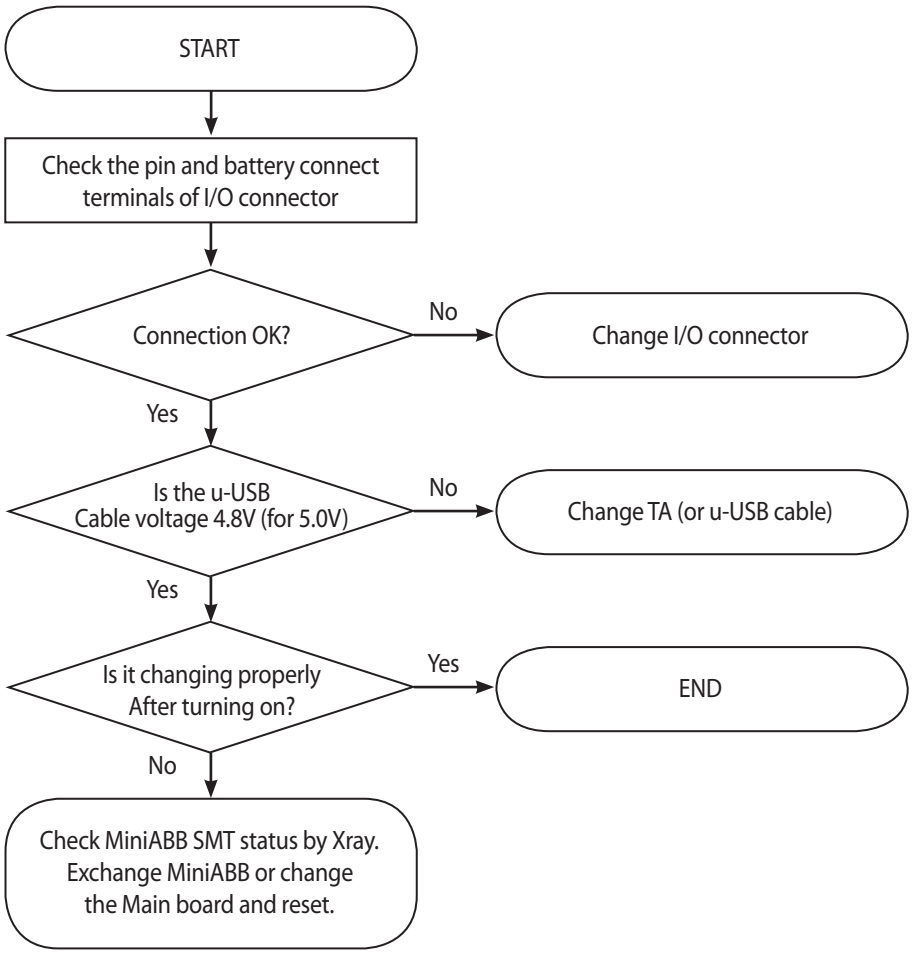
- Connection of TA or USB Cable
- Charging IC (RT8965)
- Battery

3. Troubleshooting Setup

- Connect TA and battery to the phone

4. Troubleshooting Procedure

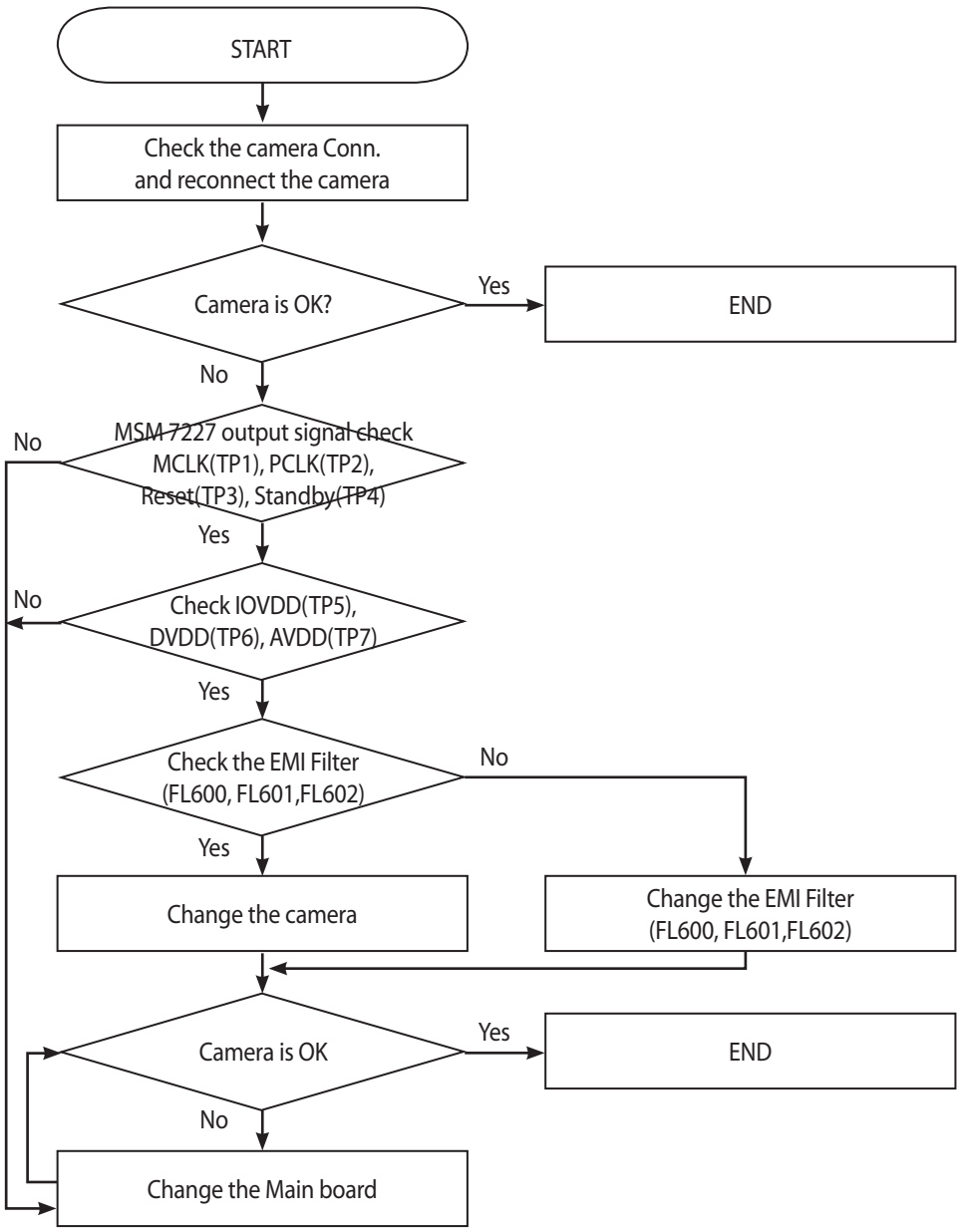
- Check the charger (TA or USB Cable)
- Check the OVP Circuit
- Check the Charging IC
- Check the battery



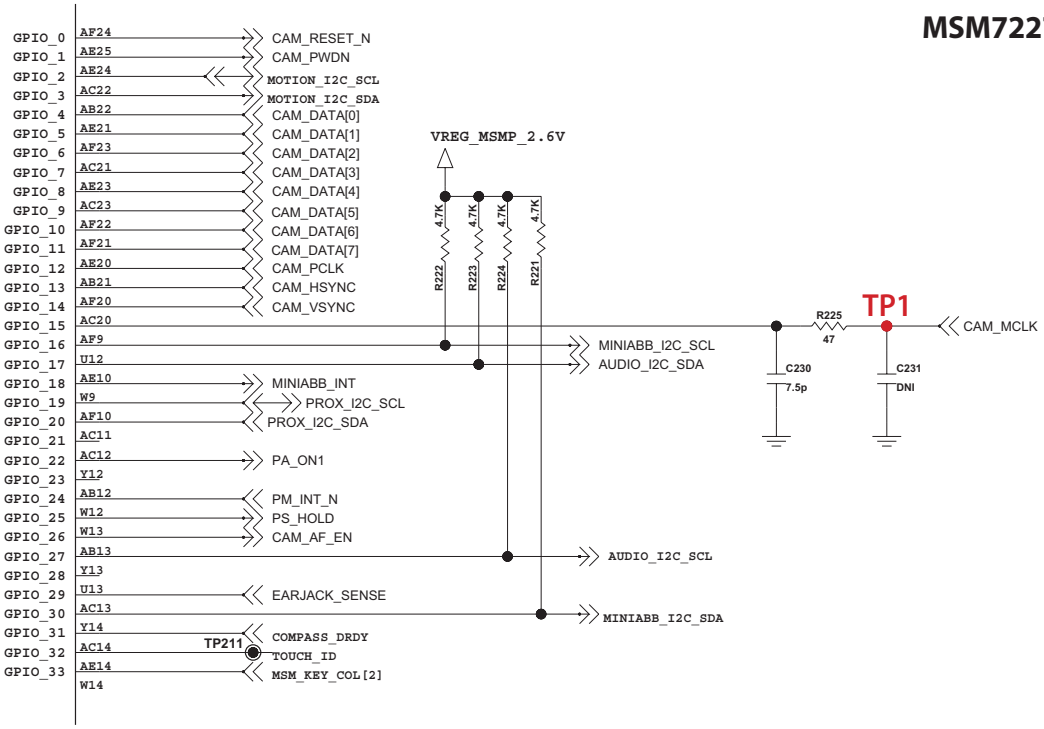
Charger Troubleshooting Flow

4.12 3M AF Camera Trouble Shooting

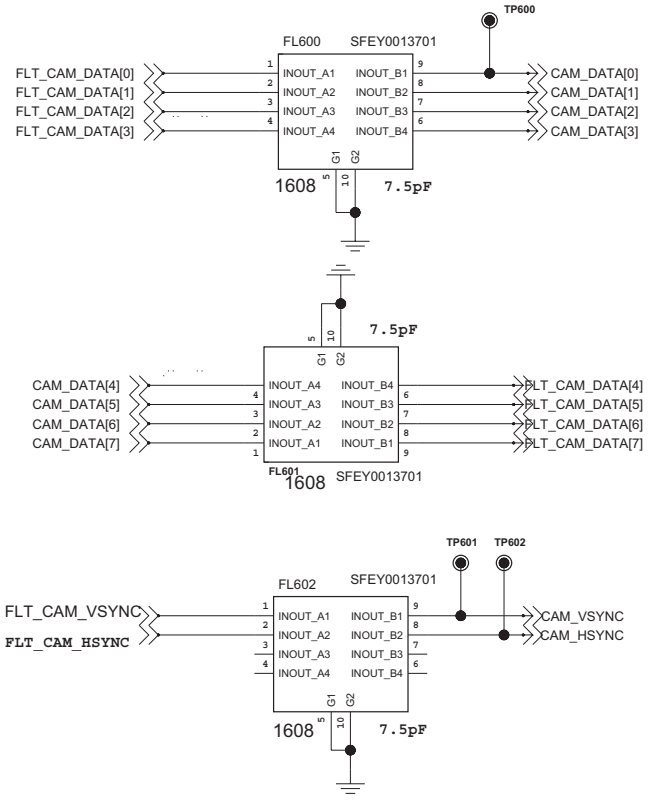
5M camera control signals are generated by Cam sensor and MSM7227T.

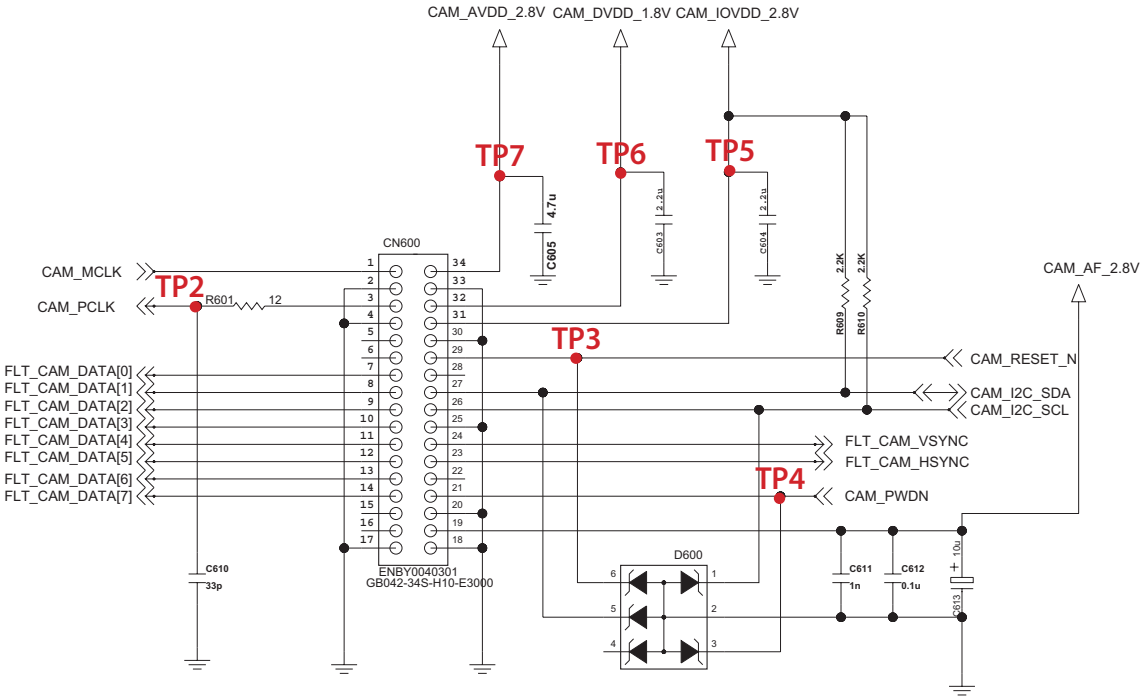


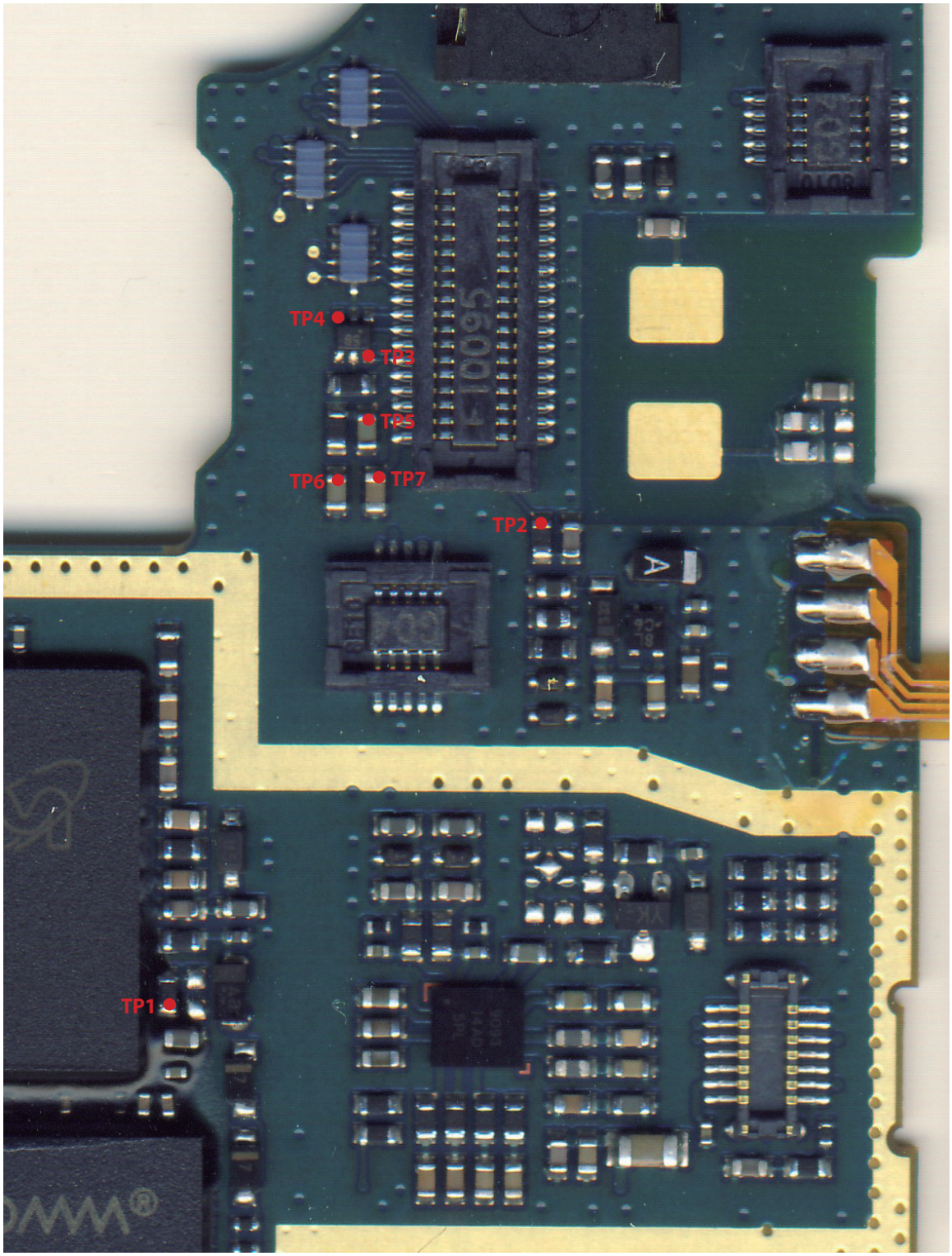
MSM7227



EMI Filter

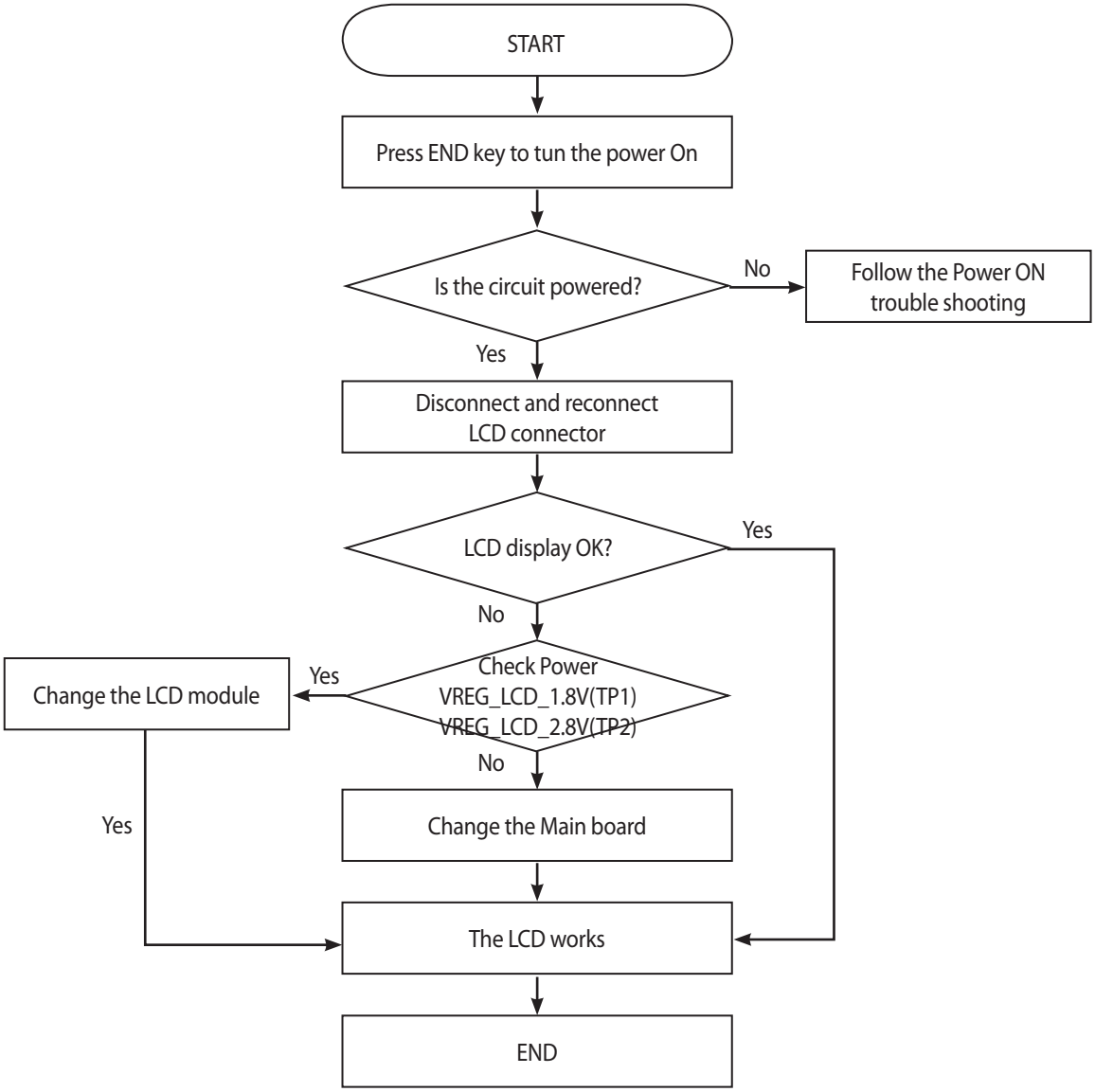


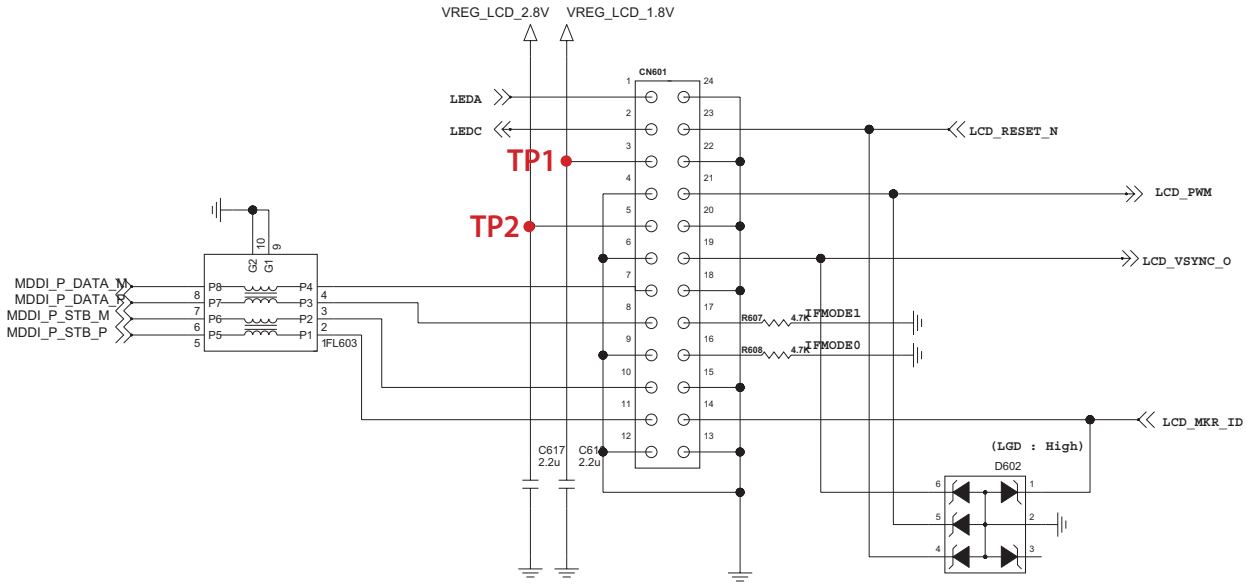


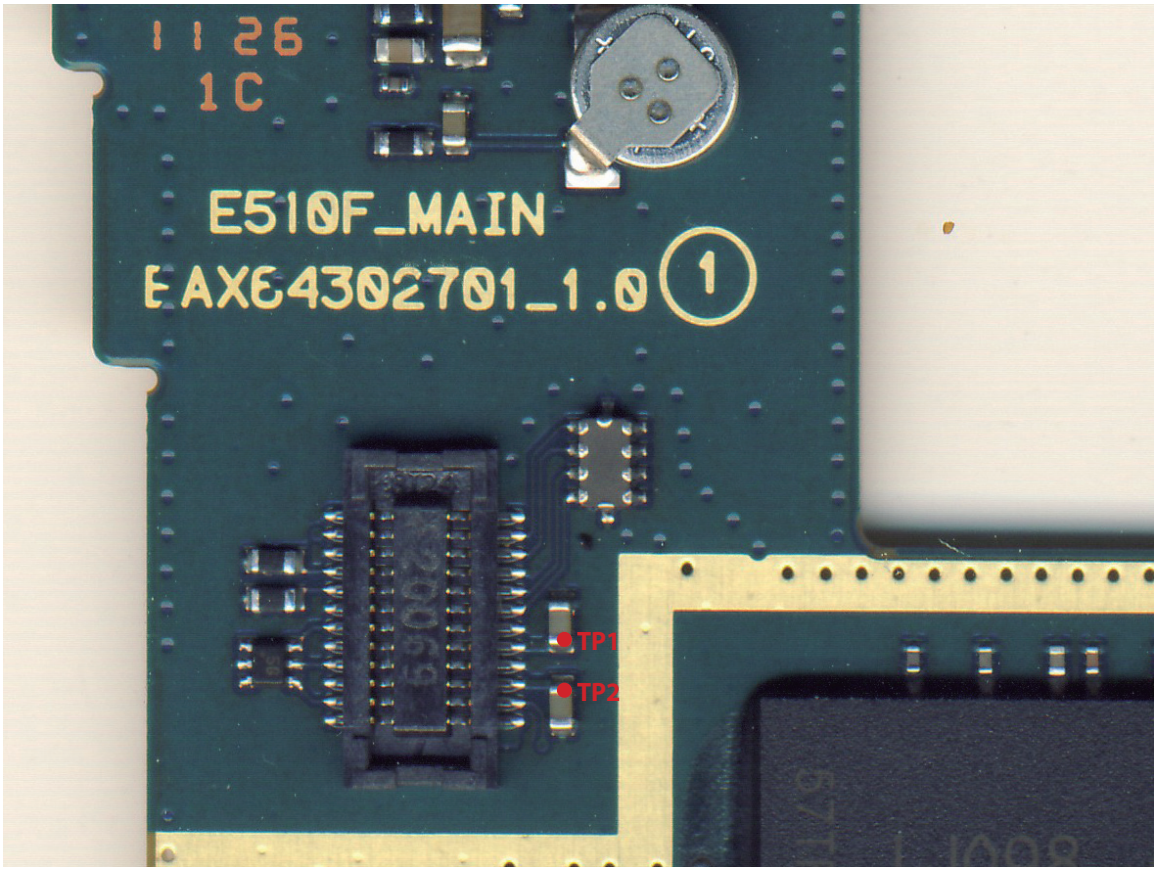


4.13 Main LCD Trouble Shooting

Main LCD control signals are generated by MSM7227T. Those signal's path are : MSM7227T → LCD Module





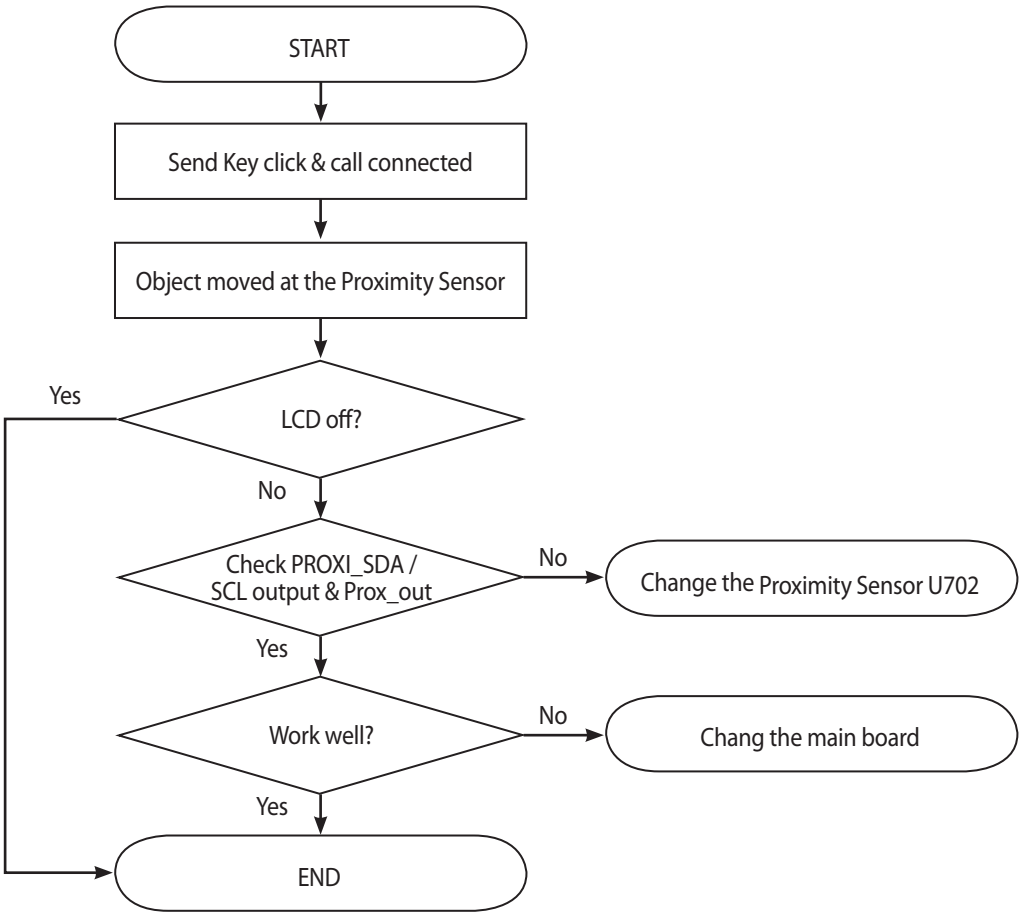


4.14 Proximity Sensor on/off Trouble Shooting

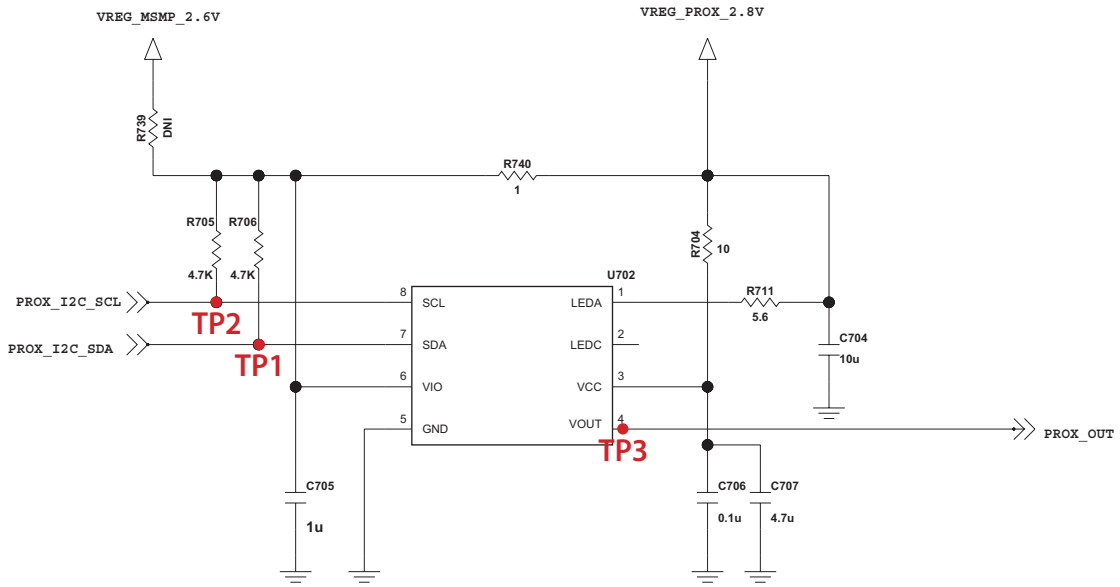
Proximity Sensor is worked as below :

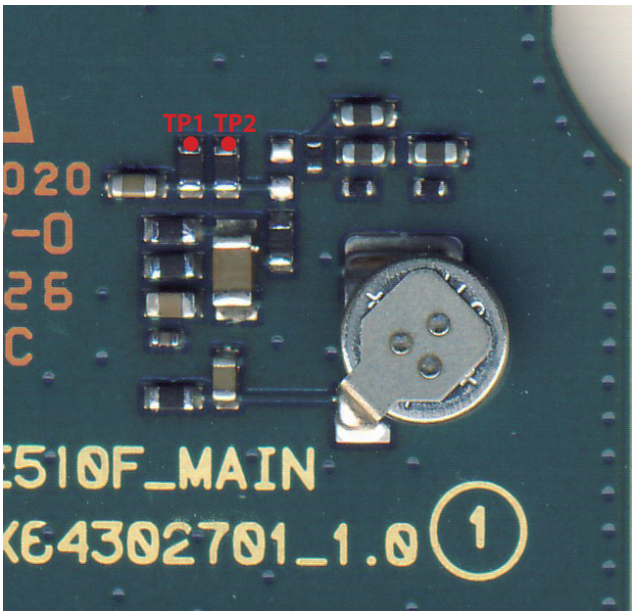
Send Key click → Phone number click → Call connected → Object moved at the sensor →

Control the screen's on/off operation automatically



Measurement
VREG_MSMP_2.6V
VREG_PROX_2.6V
PROX_OUT
PROX_I2C_SCL / SDA

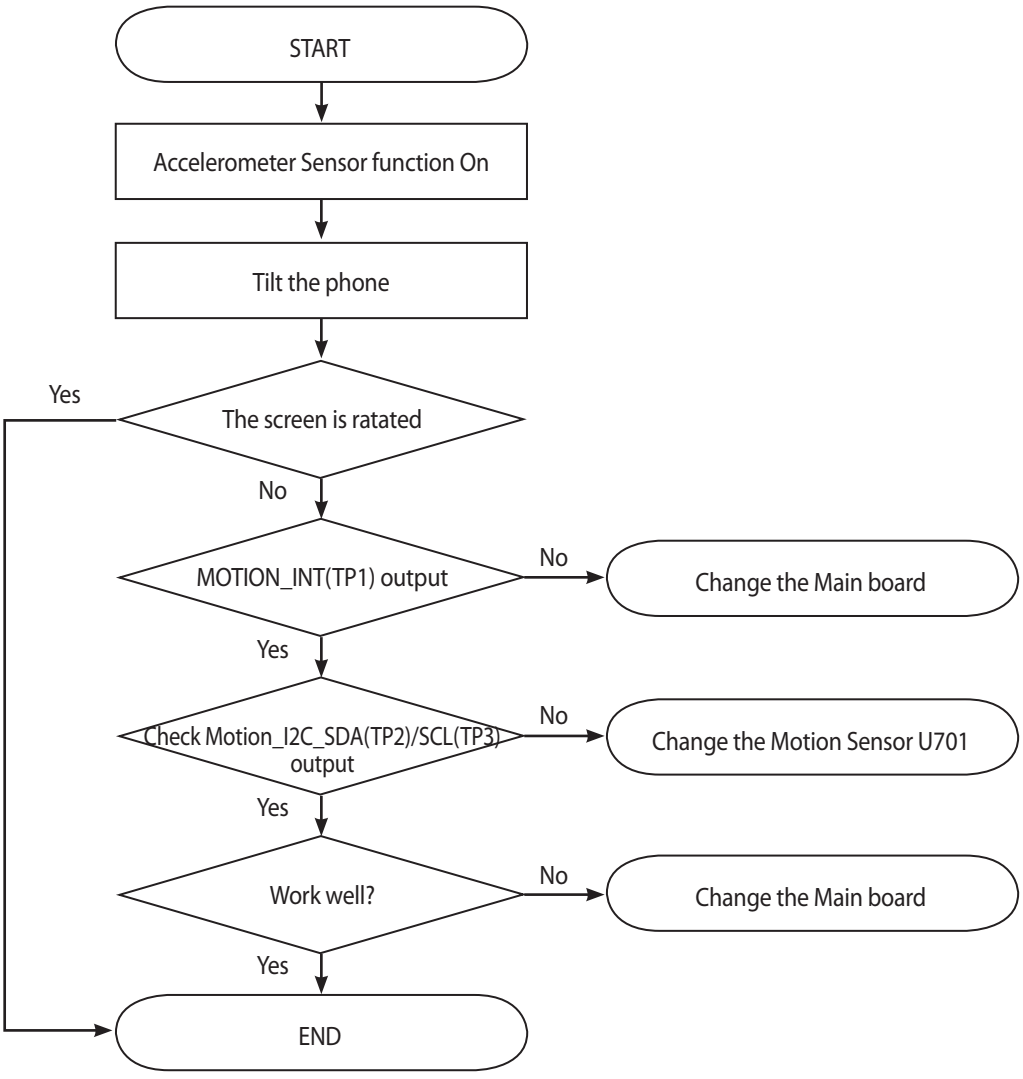




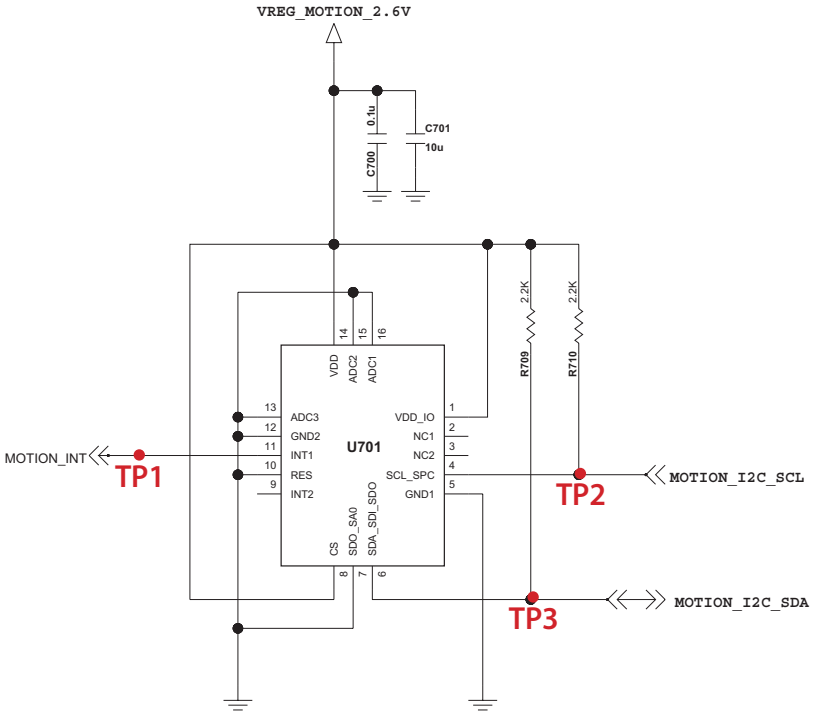
4.15 Motion Sensor on/off Trouble Shooting

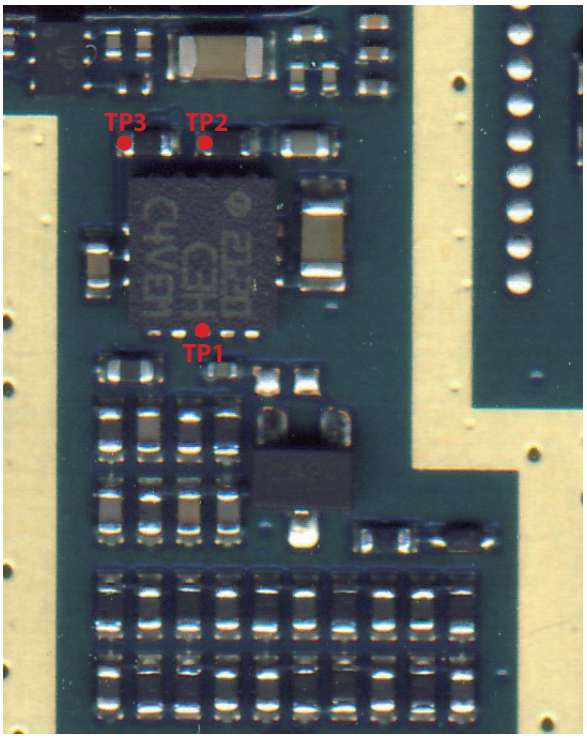
Motion Sensor is worked as below :

Accelerometer Sensor function On → Tilt the phone (90˚) → The screen is had rotated automatic



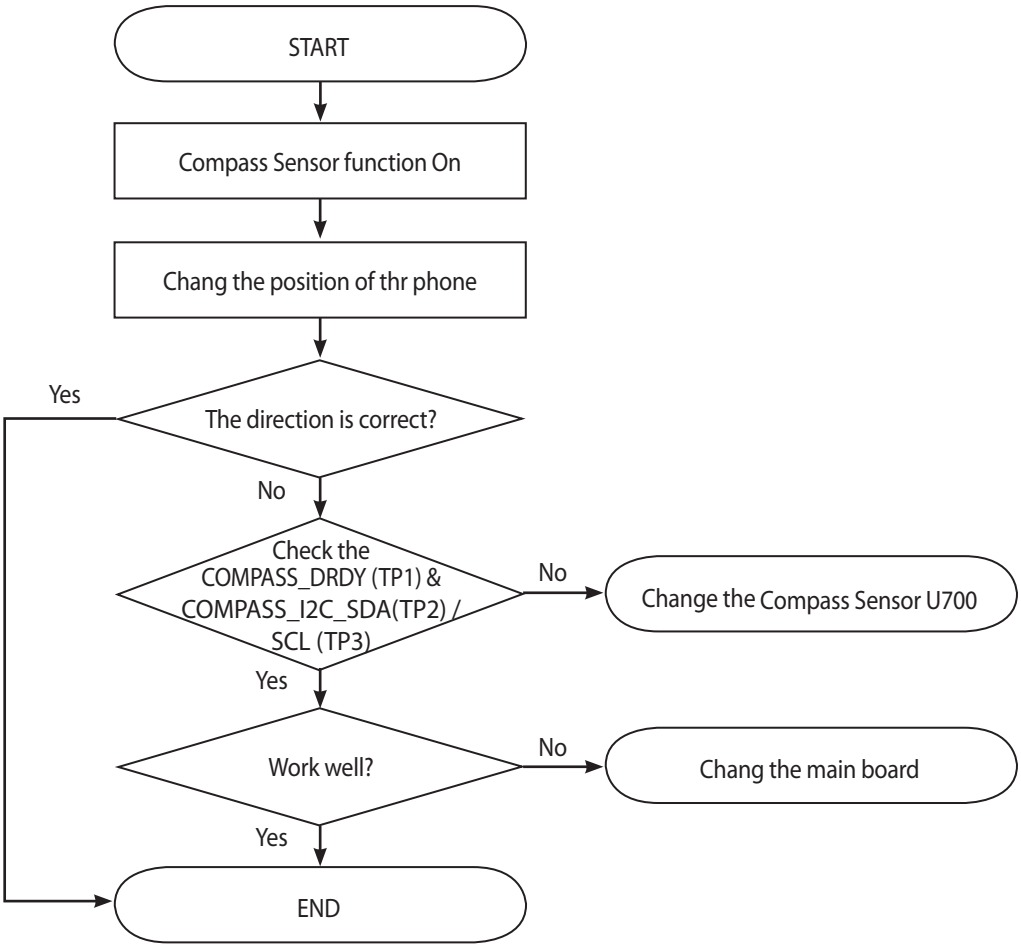
Measurement
VREG_MOTION_2.6V
MOTION_INT
MOTION_I2C_SDA / SCL



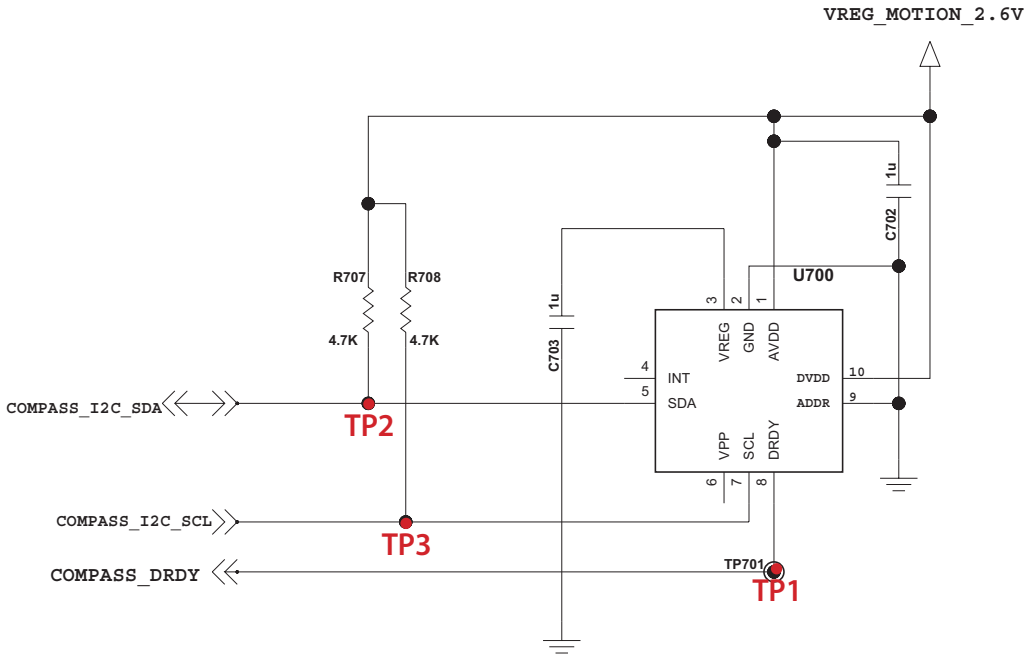


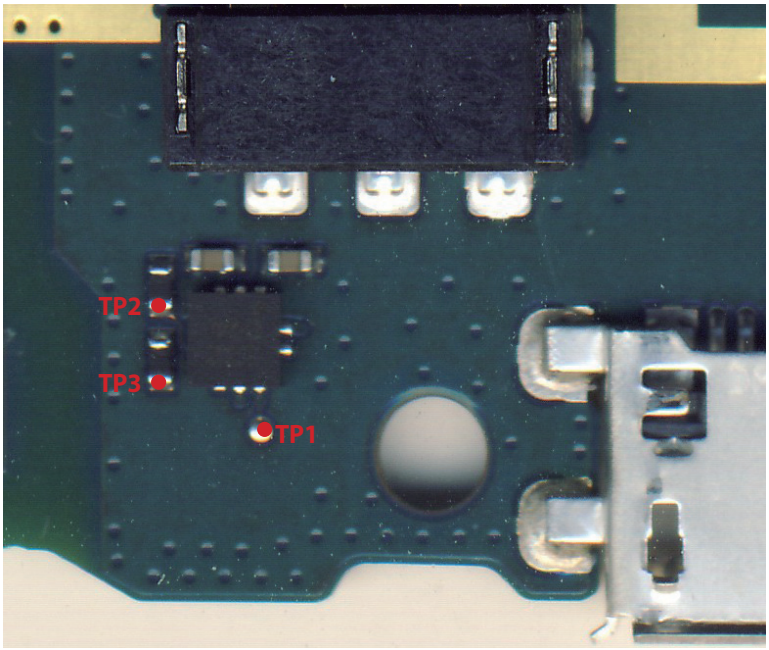
4.16 Compass Sensor on/off Trouble Shooting

Compass Sensor is worked as below : Compass Sensor function On



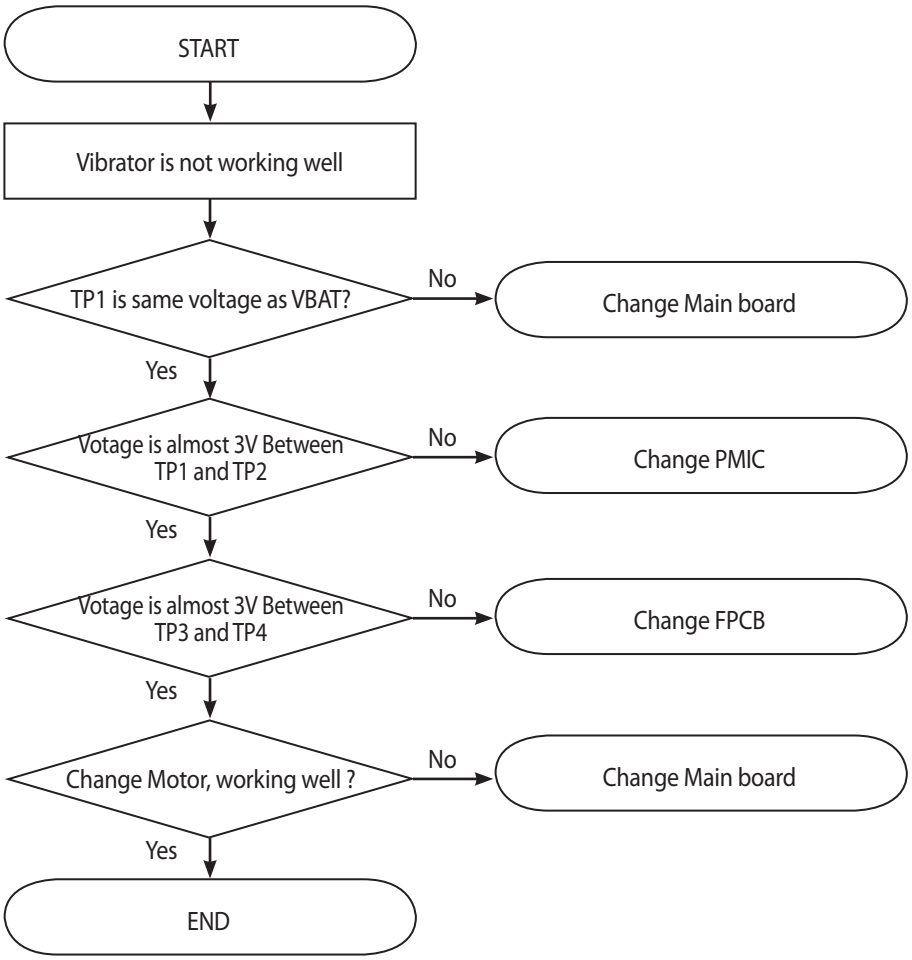
Measurement
VREG_COMPASS_2.6V
COMPASS_I2C_SCL / SDA
COMPASS_DRDY



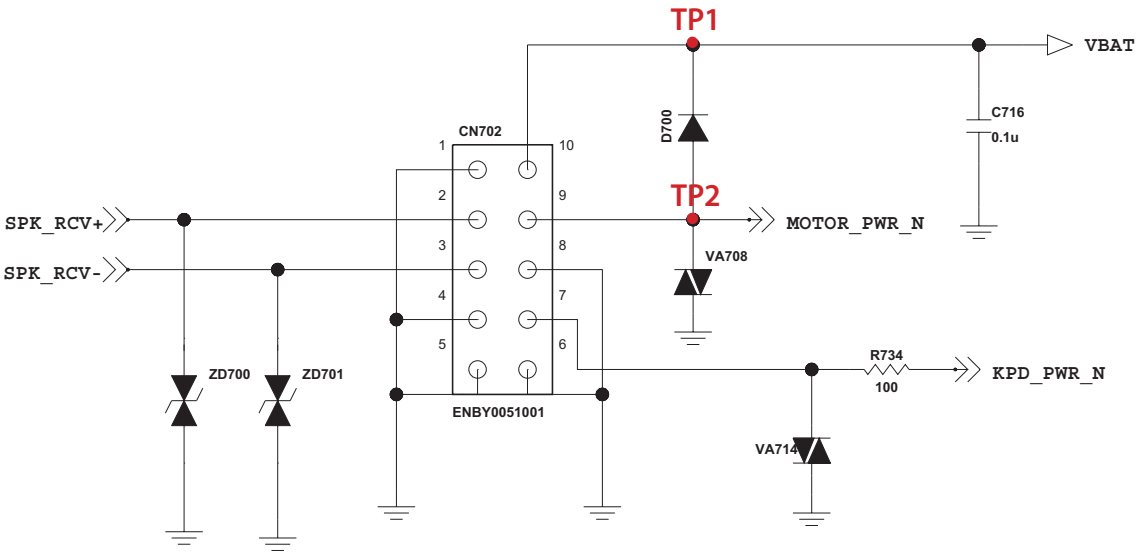


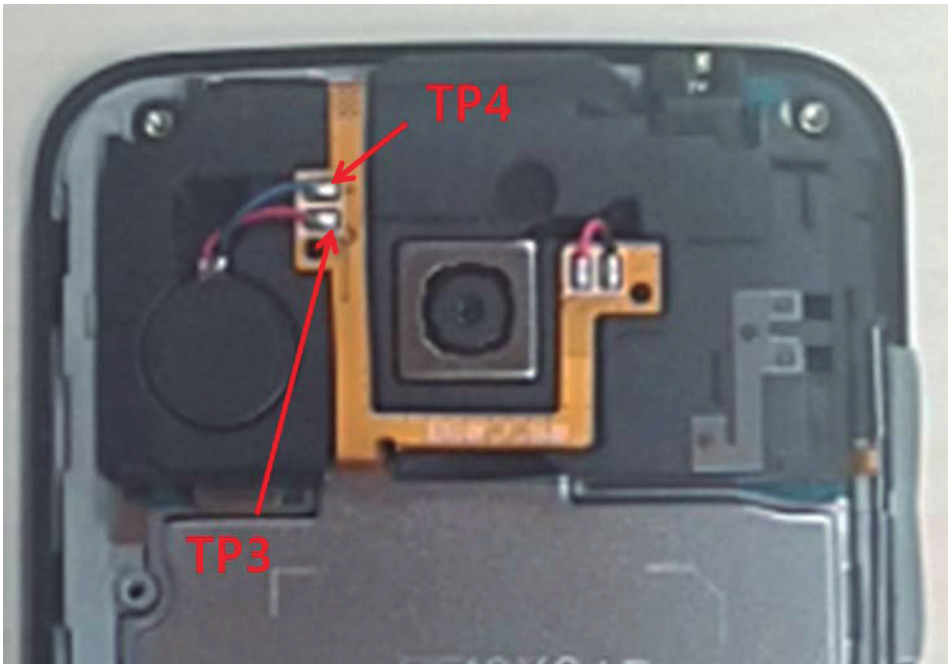
4.17 DC Motor Trouble Shooting

Vibrator is worked as below



Measurement
VBAT
MOTOR_PWR_N





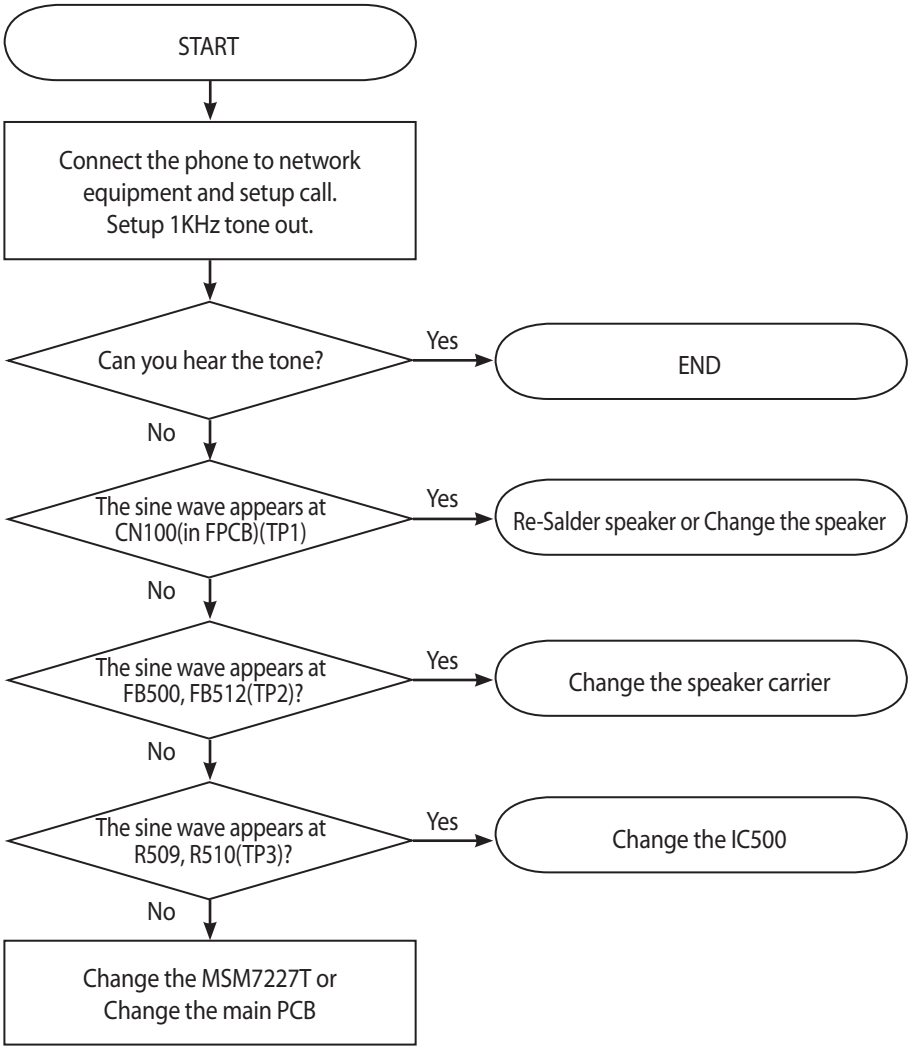
4.18 Audio Troble

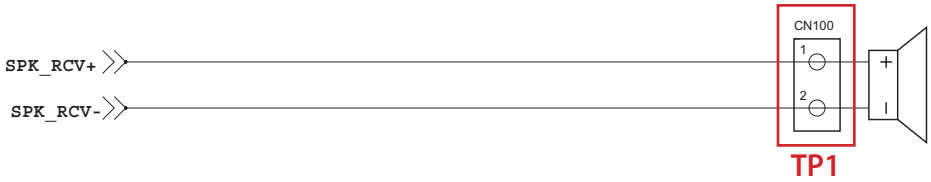
4.18.1 Receiver Path

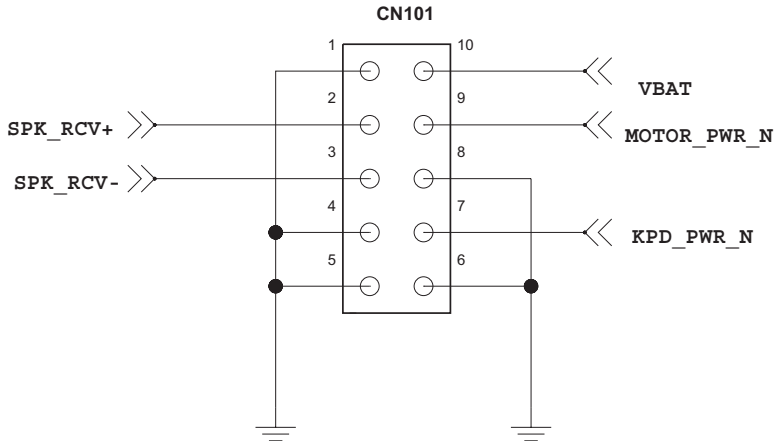
MSM7227T EAR1_OP, EAR1_ON → RCV_P, RCV_N → C511, C514 → R509, R510(TP3) →

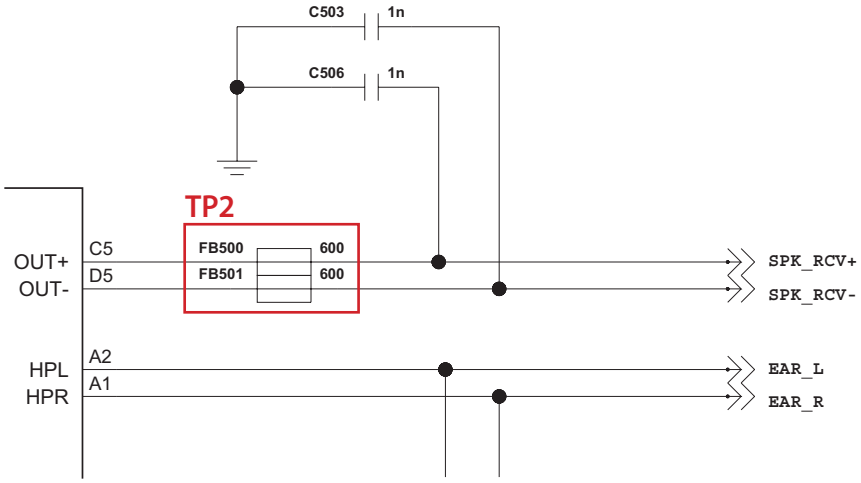
IC500(WM9093ECS-R : Audio Subsystem) → FB500, FB501(TP2) → CN702 ◊ CN101(FPCB conn.) →

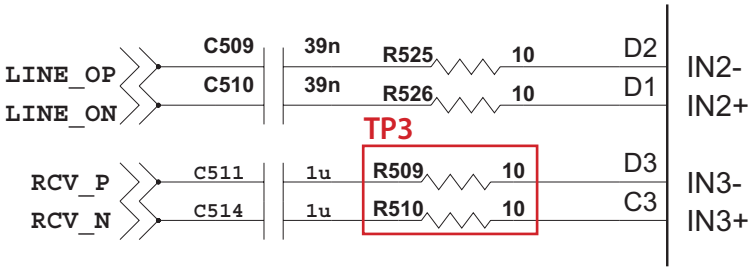
CN100(TP1)(SPK solder pad)

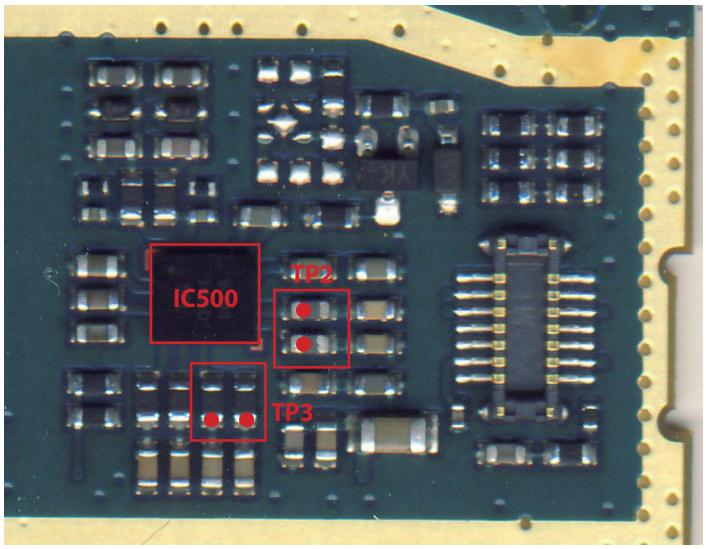






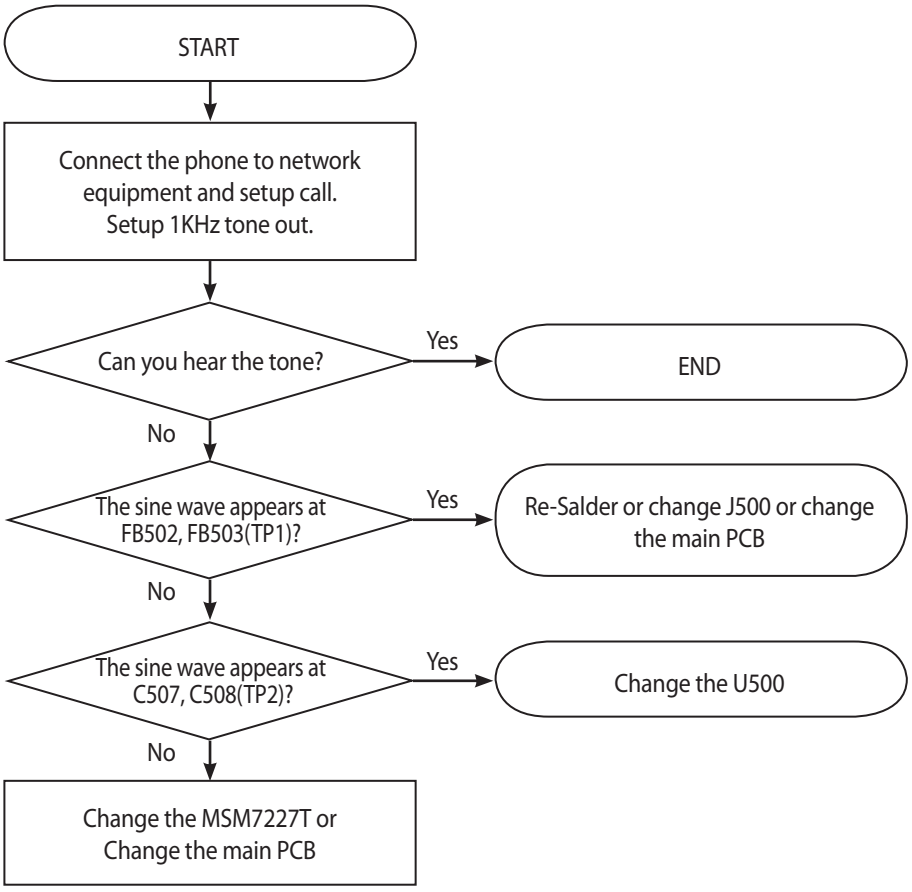


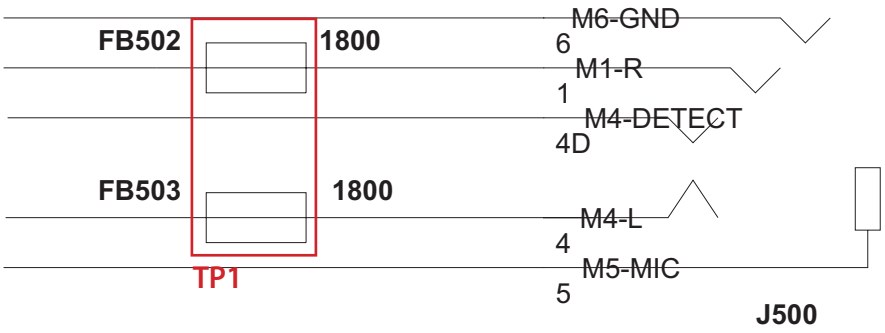


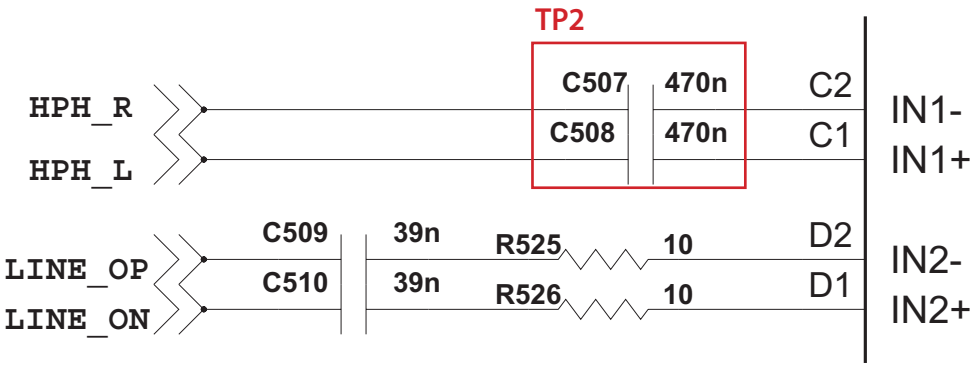


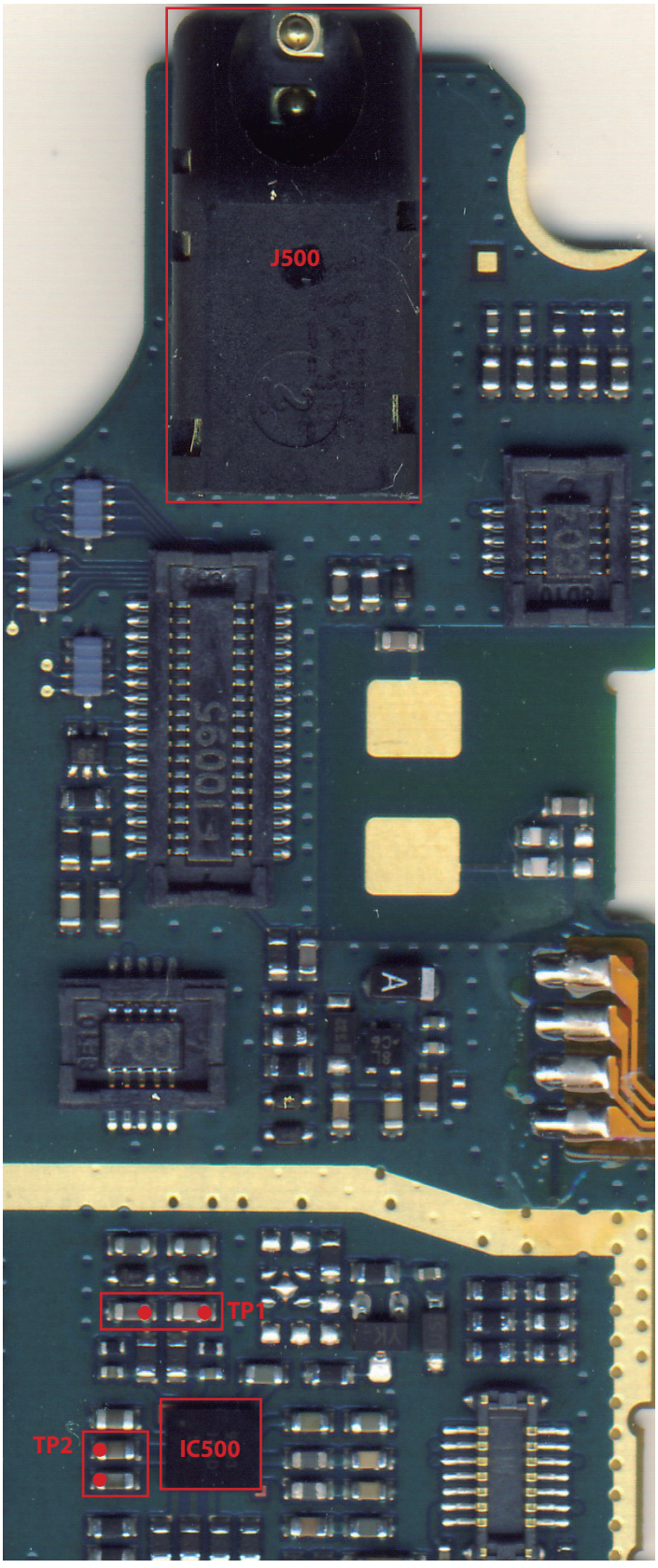
4.18.2 Headset path

MSM7227T HPH_R, HPH_L → C507, C508(TP2) → IC500(WM9093ECS-R : Audio Subsystem) → R508, R511 → FB502, FB503(TP1) → J500 (3.5pi Ear-jack)





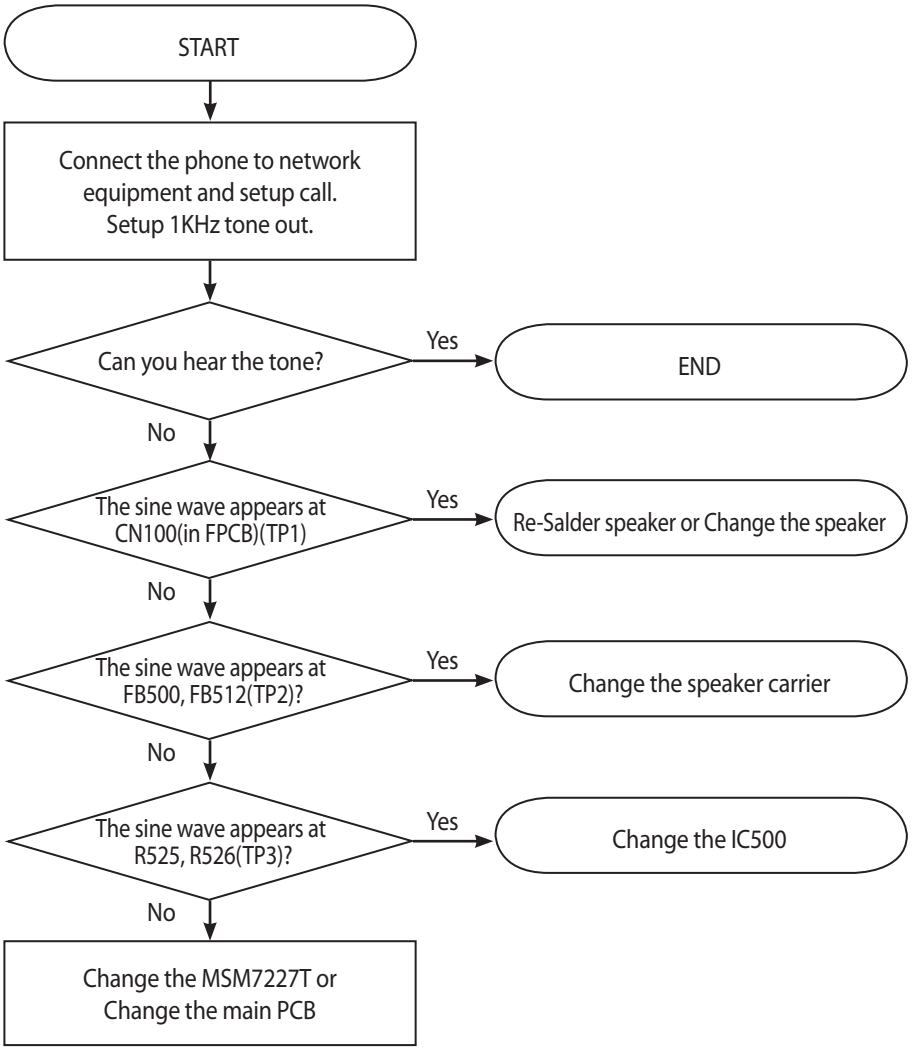


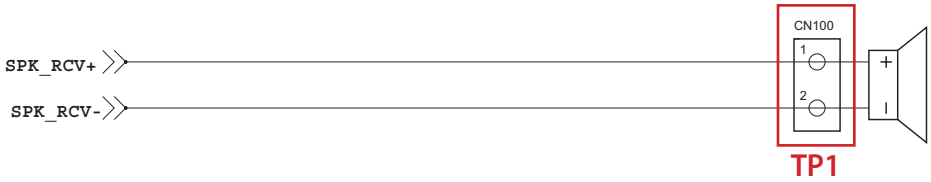


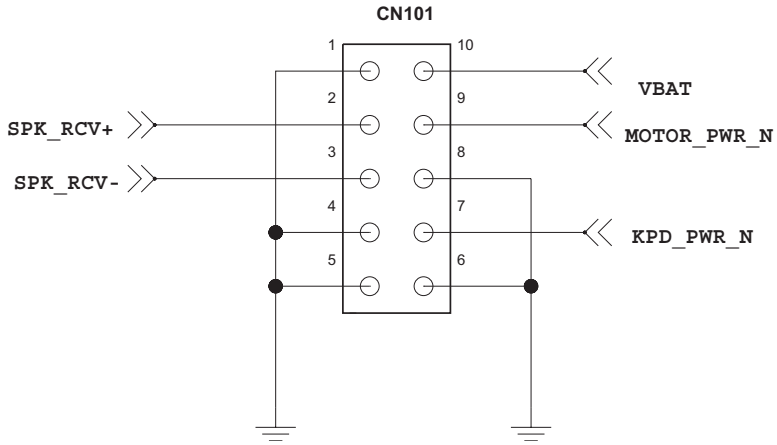
4.18.3 Speaker/Speaker Phone path

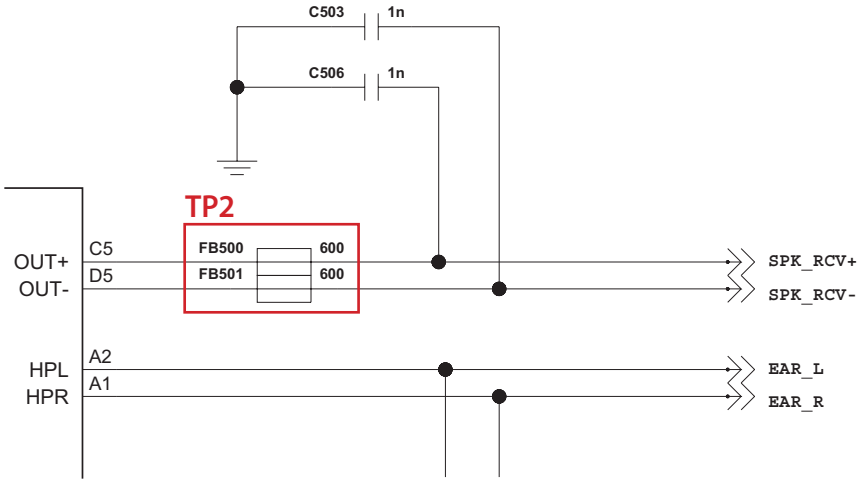
MSM7227T LINE_OP(LINE_ON) → C509, C510 → R525, R526(TP3) → IC500(WM9093ECS-R :

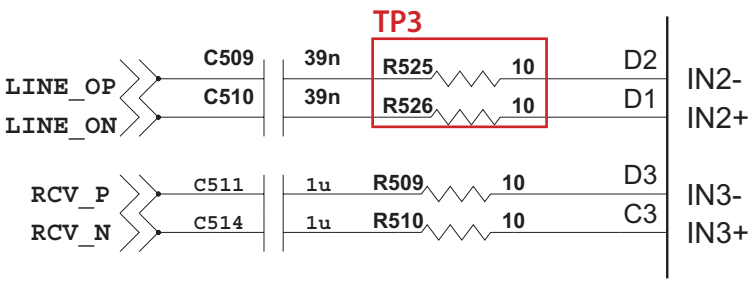
Audio Subsystem) → FB500, FB501(TP2) → CN702 ◊ CN101(FPCB conn.) → CN100(TP1)(SPK solder pad)

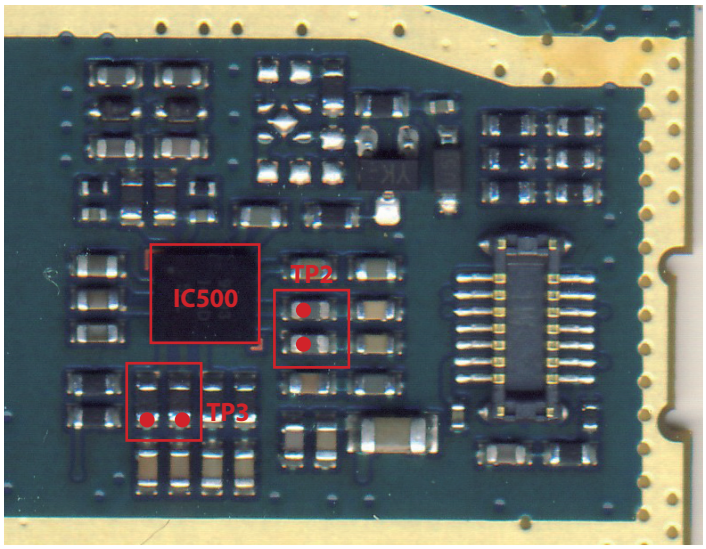








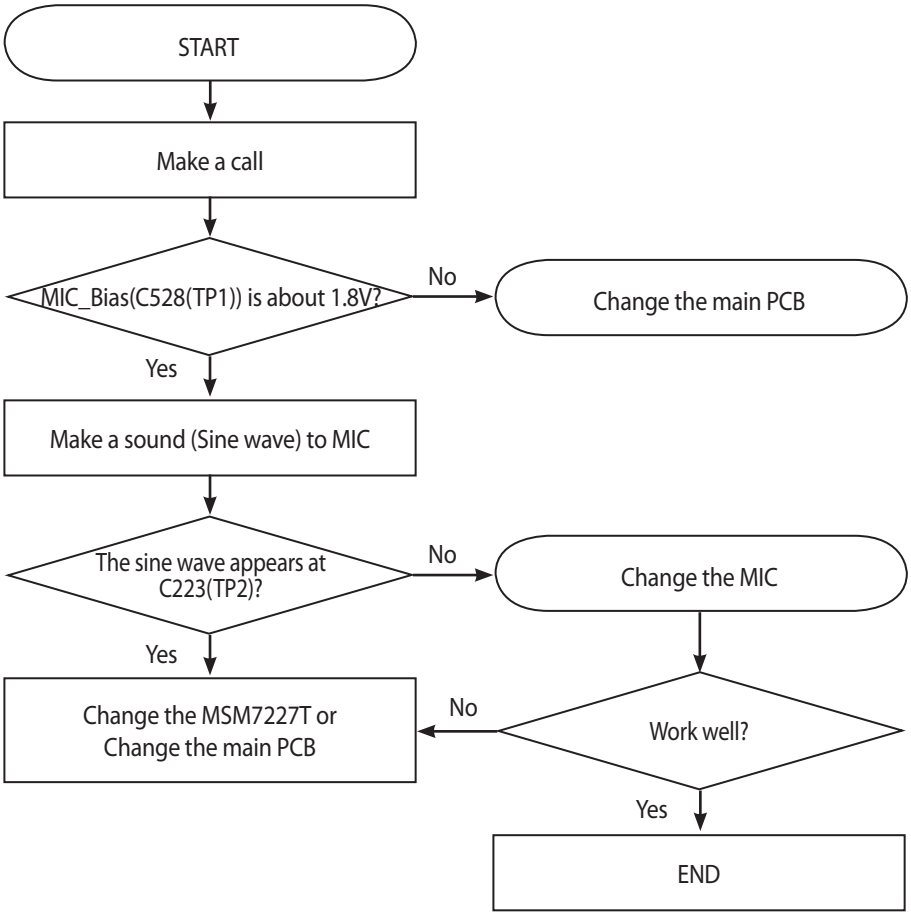


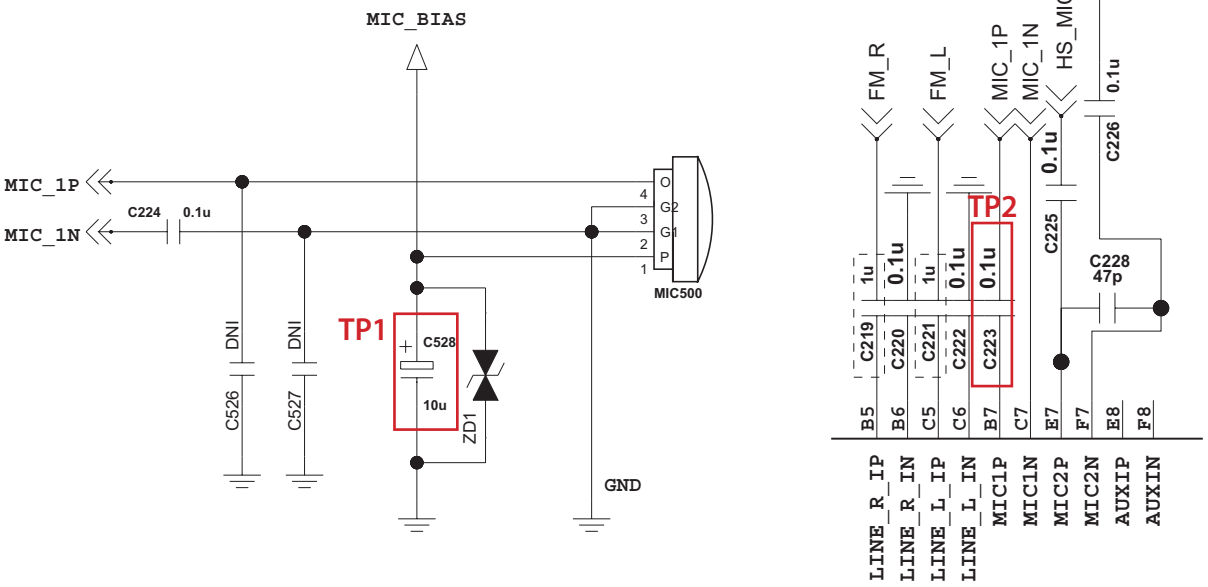


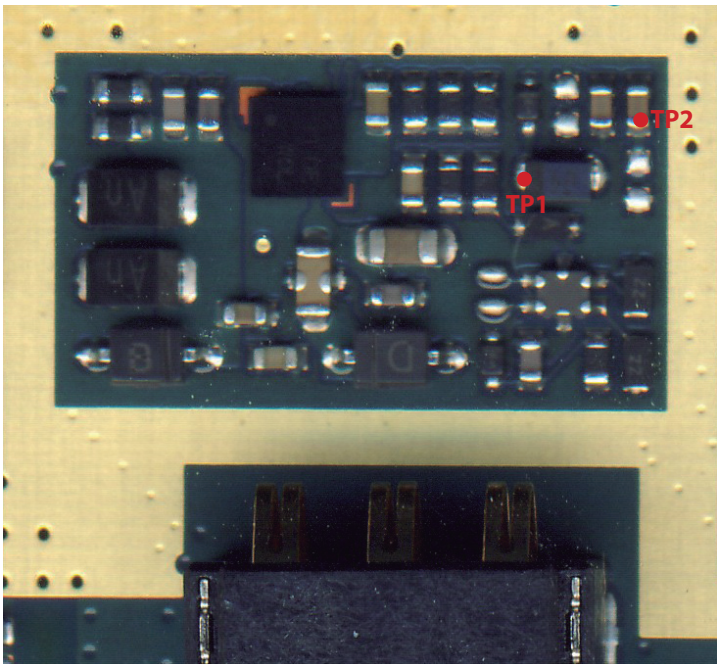
4.18.4 Main Microphone

MIC Signal : MIC500 → C223, C224(TP2) → MIC1P of MSM7227T

MIC Bias : HIC_BIAS → C528(TP1) → MIC500



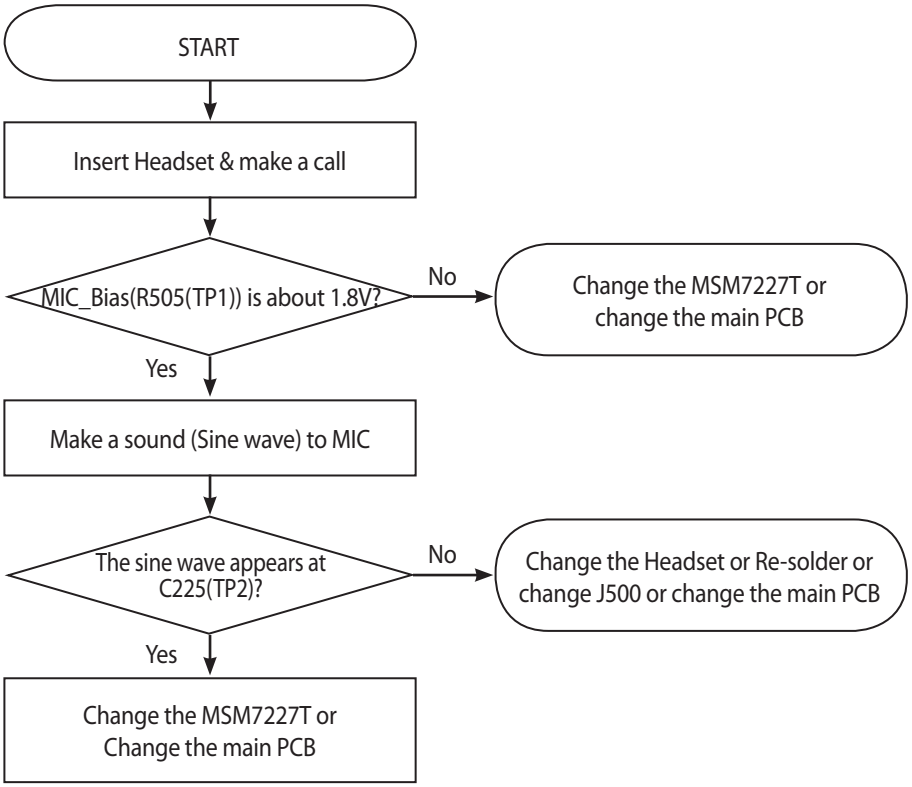


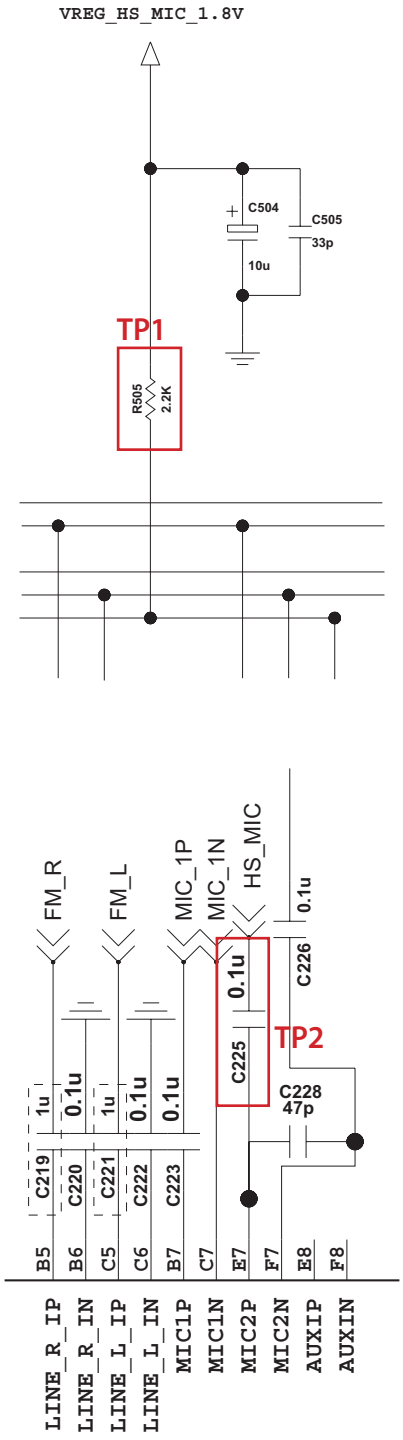


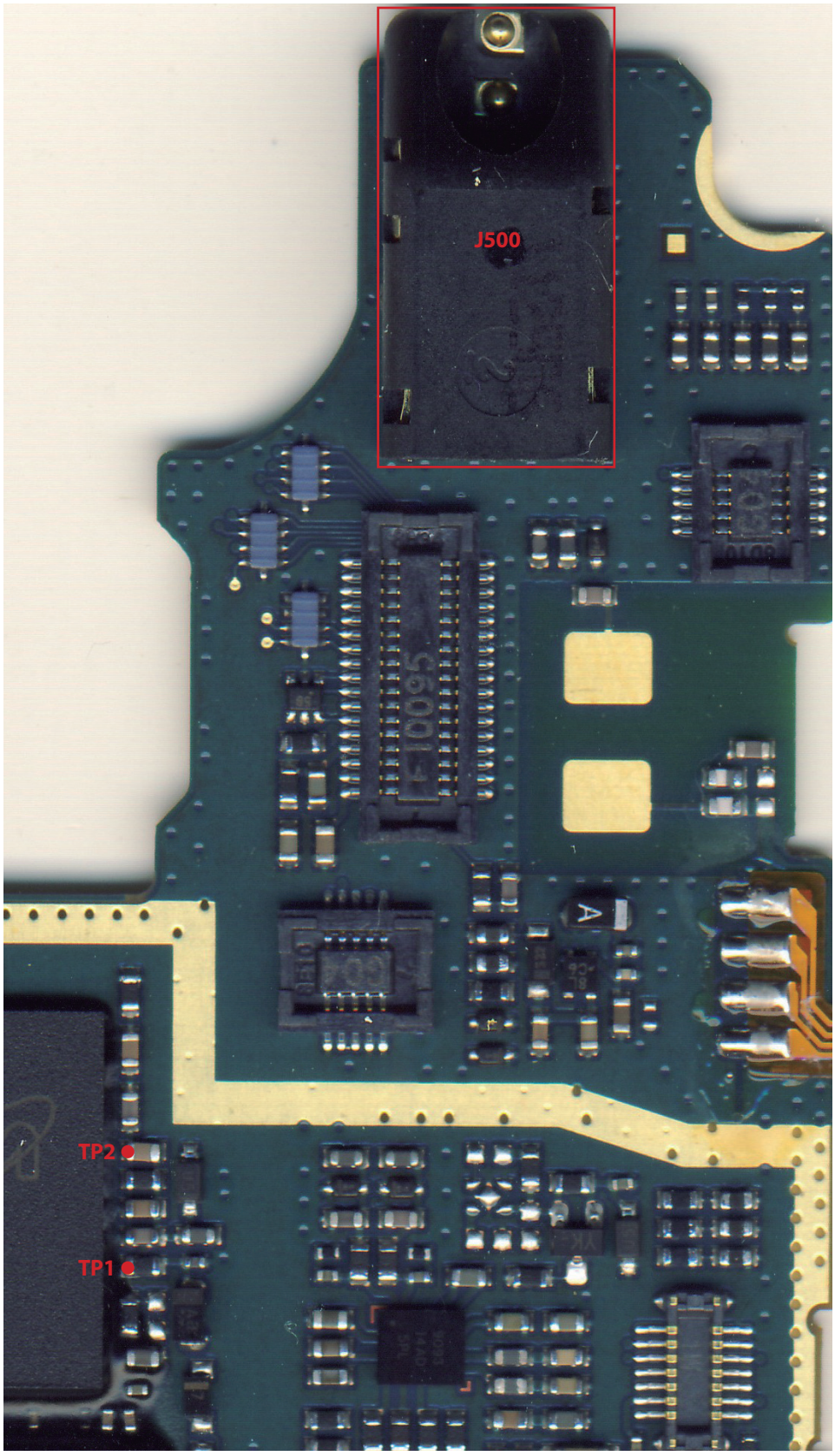
4.18.5 Headset micr ophone

MIC Signal : 3.5 pi Headset(J500) → FB504 → C225(TP2) → MIC2P of MSM7227T

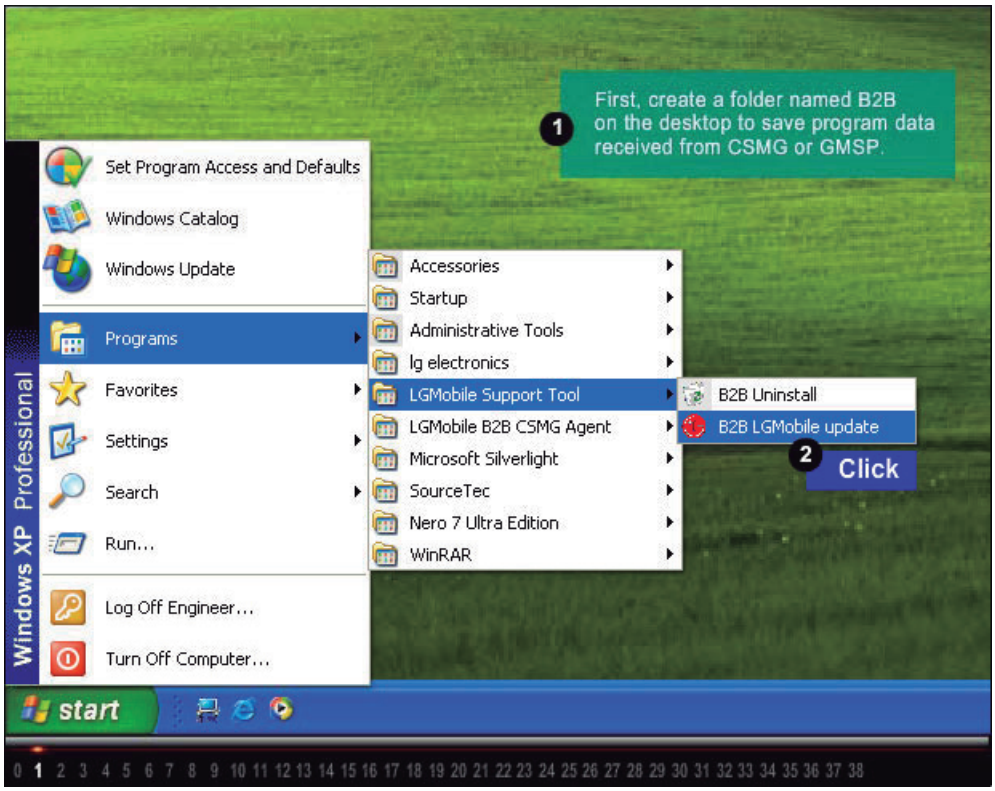
MIC Bias : VREG_GP4 → VREG_HS_MIC_1.8V → R505(TP1) → FB504 → Headset MIC

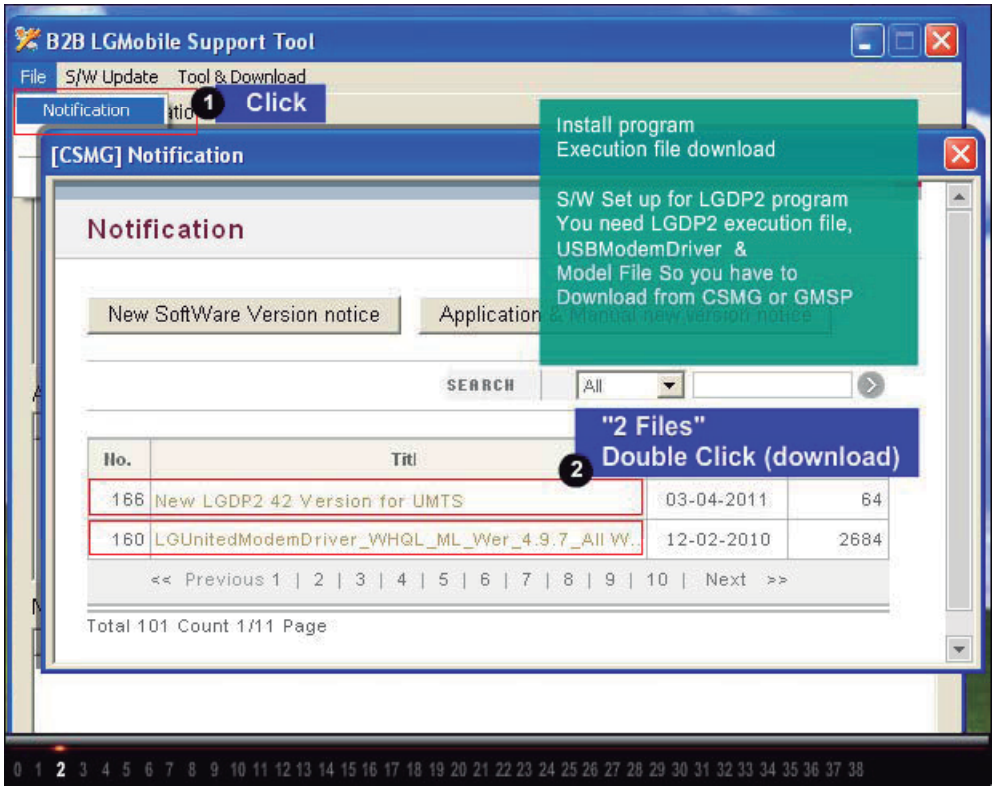


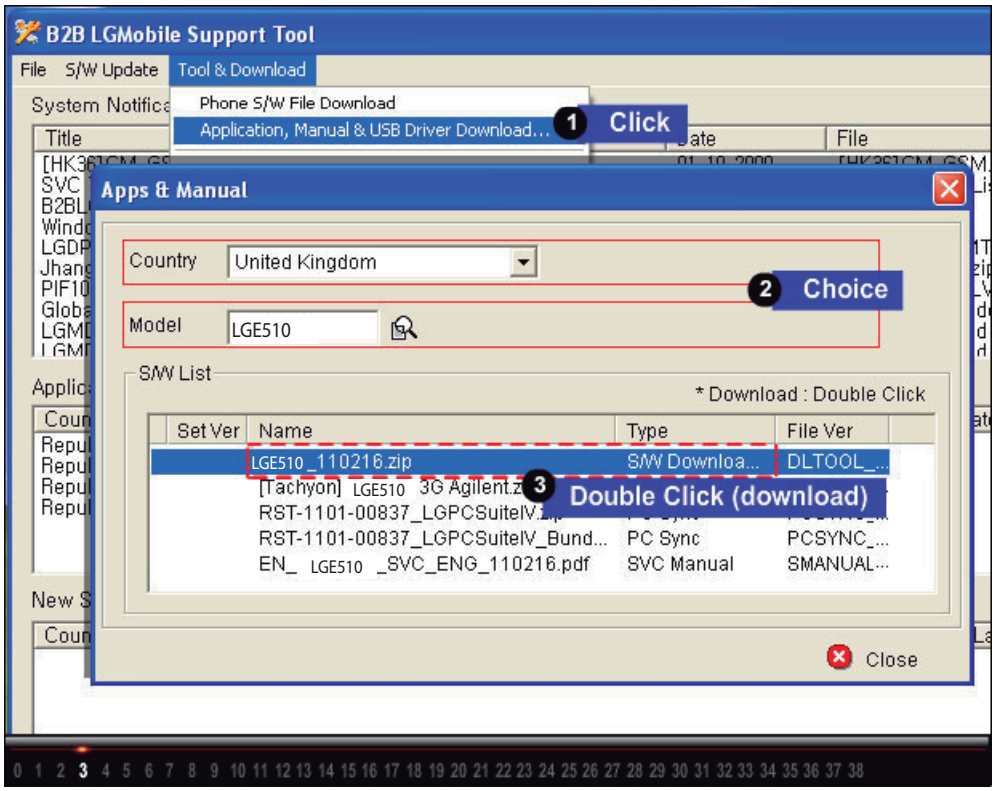


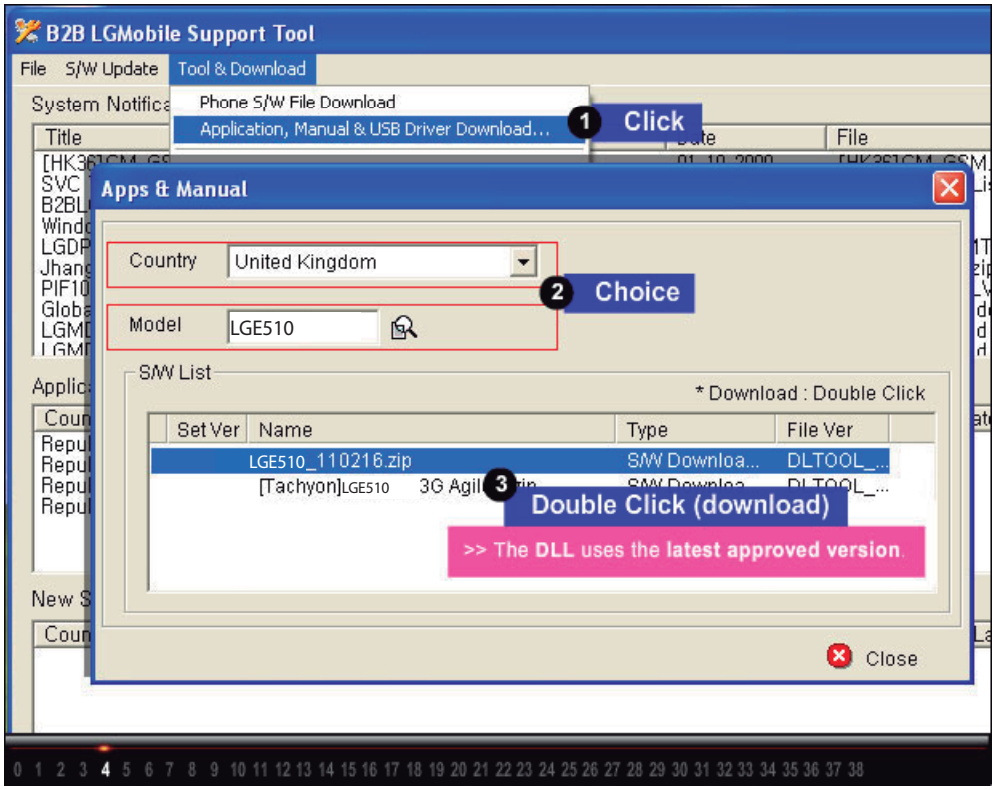


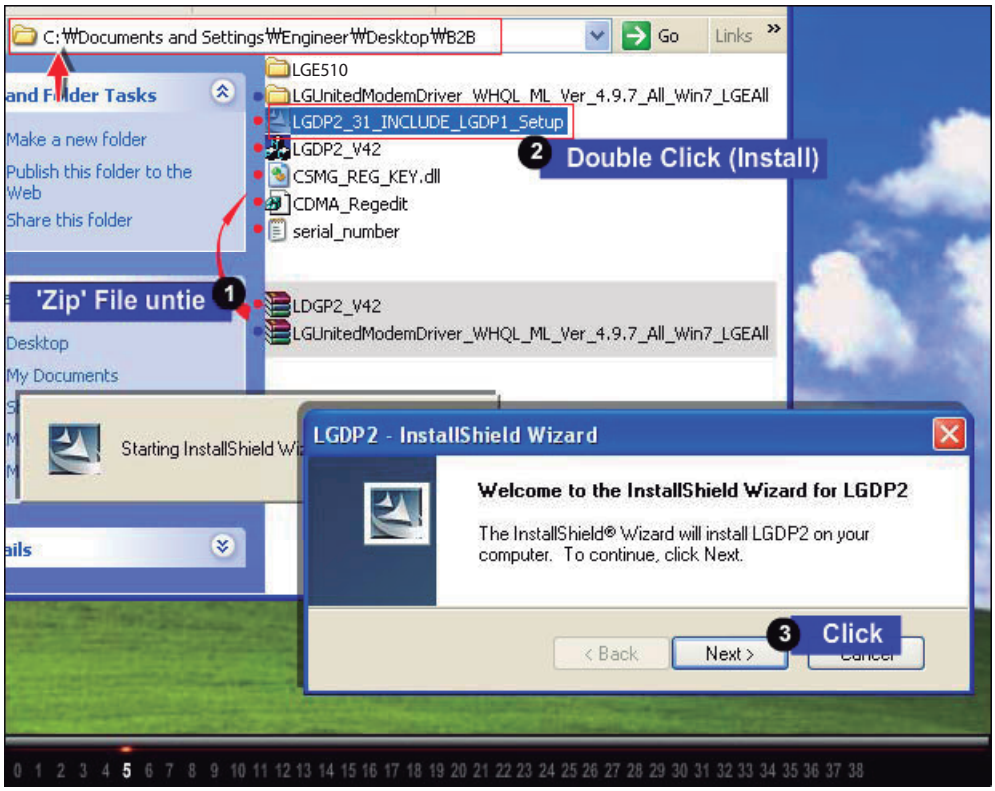
5. DOWNLOAD

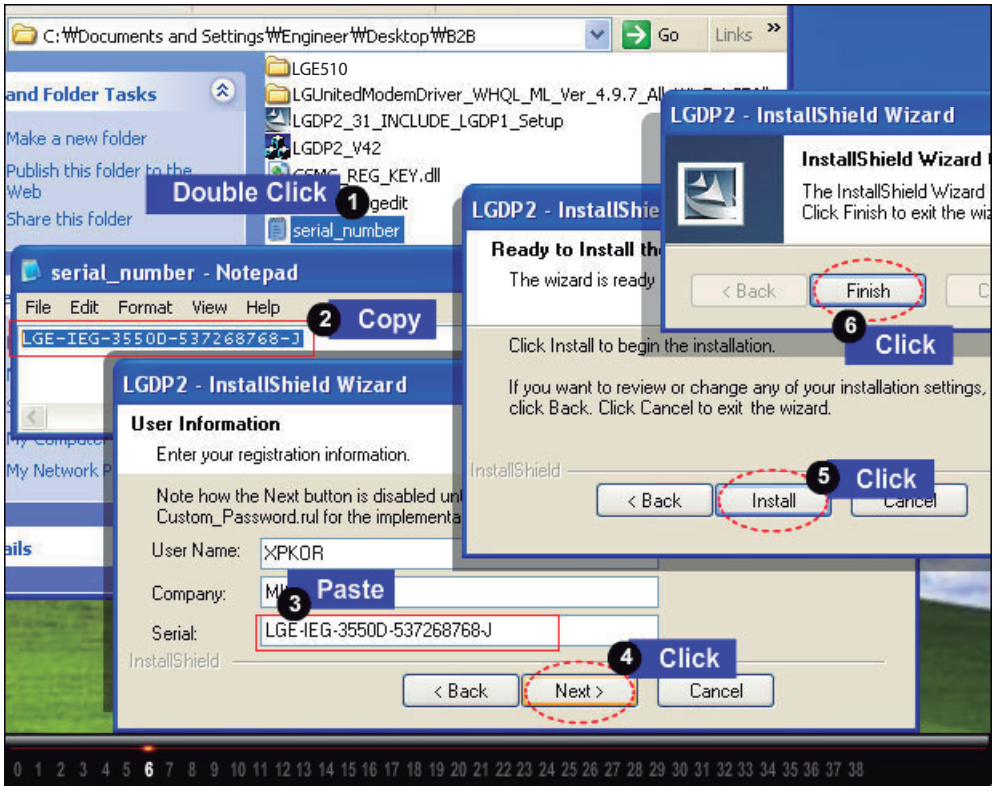


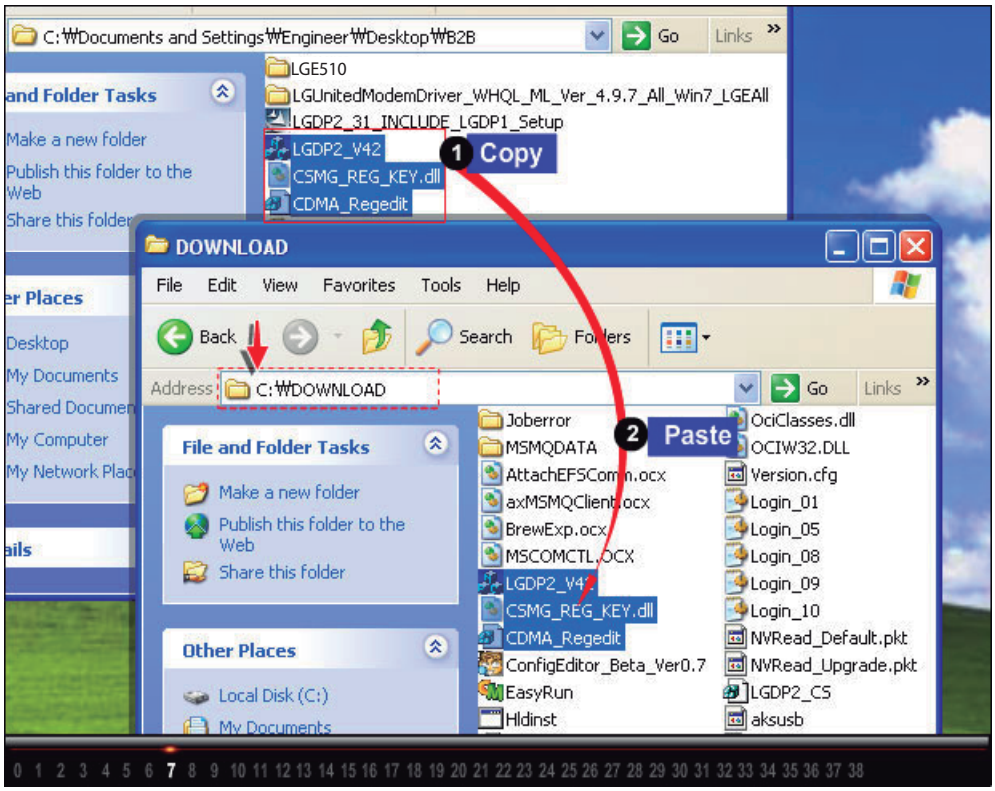


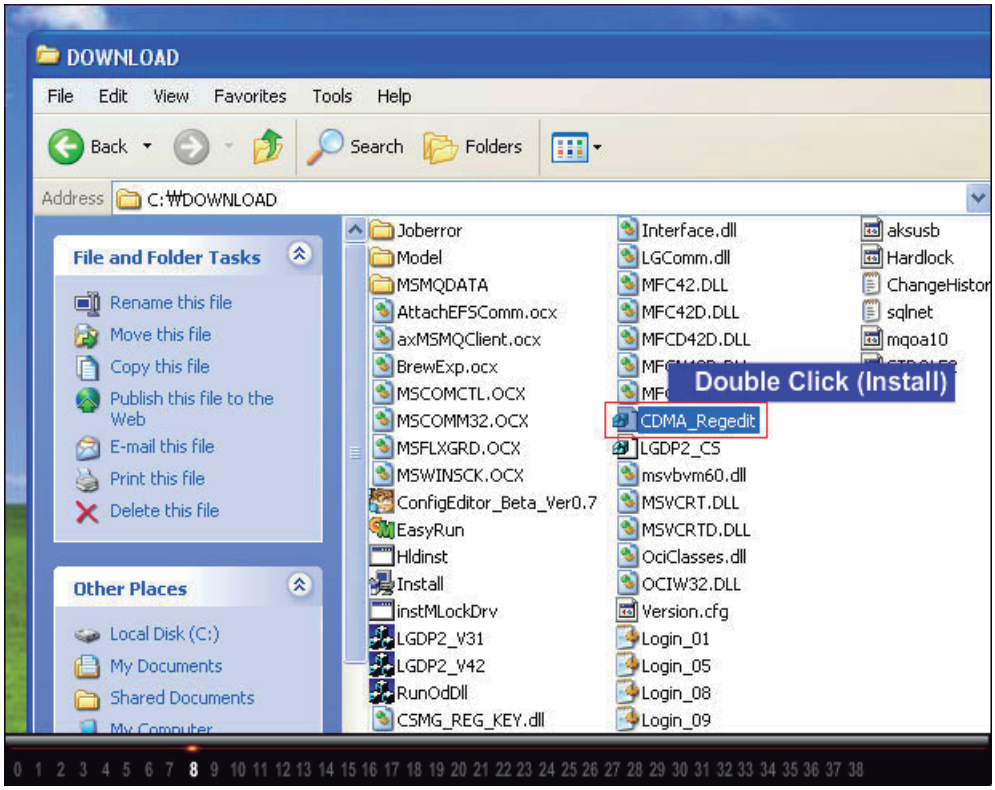


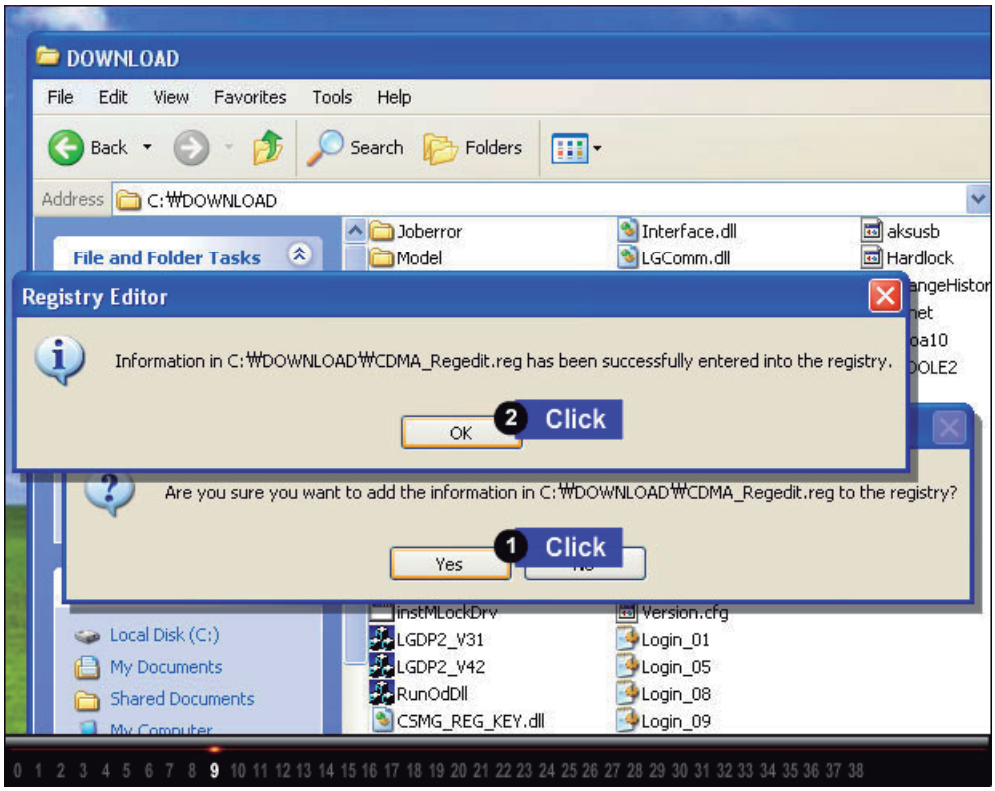


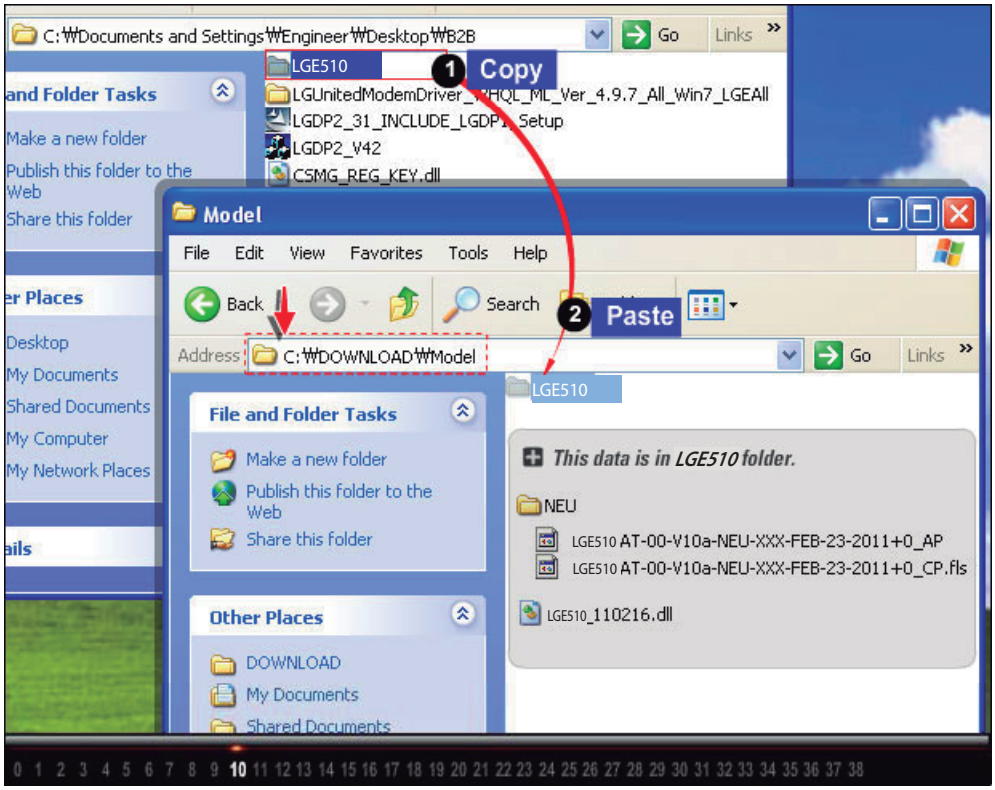


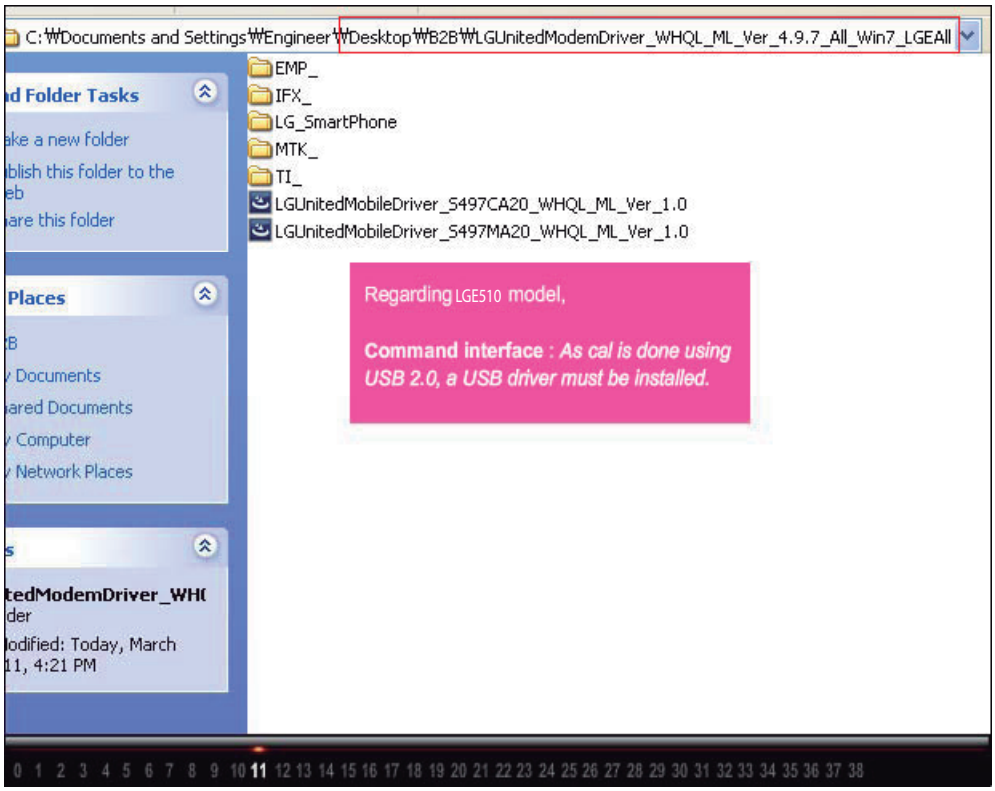


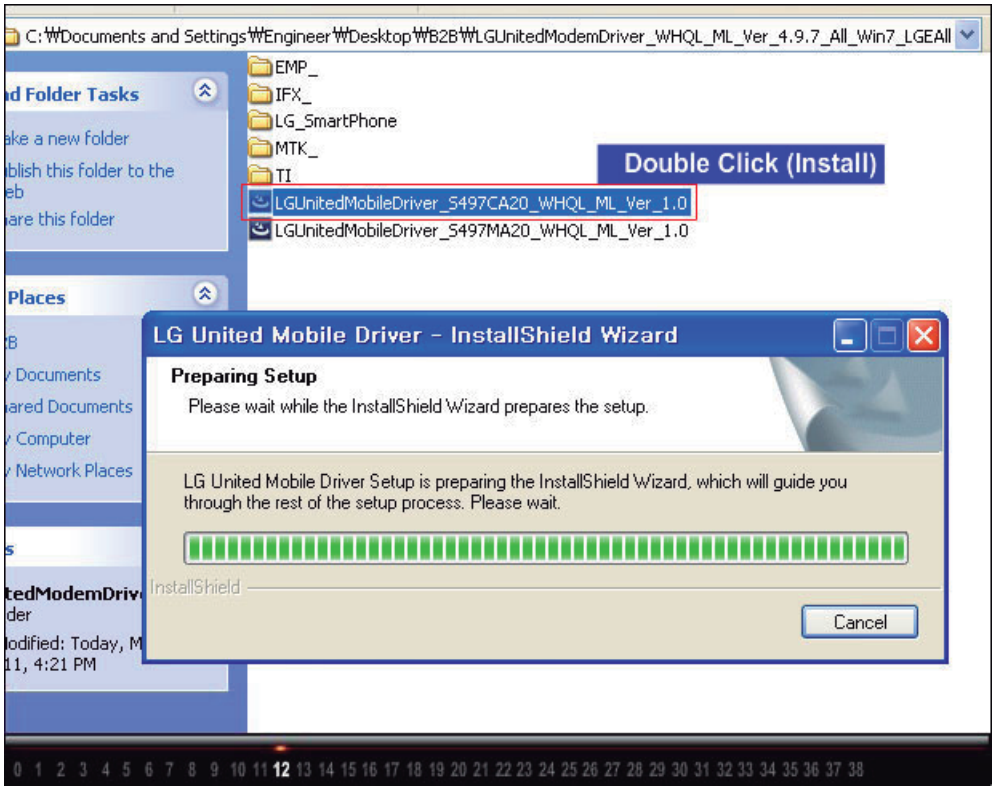


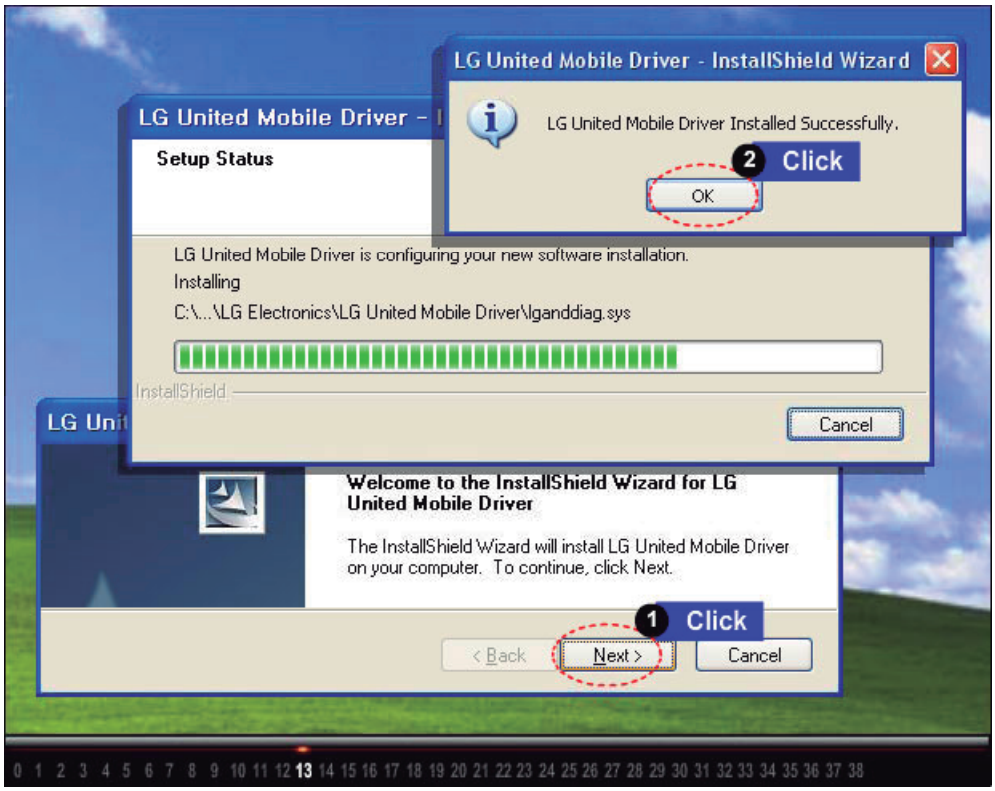


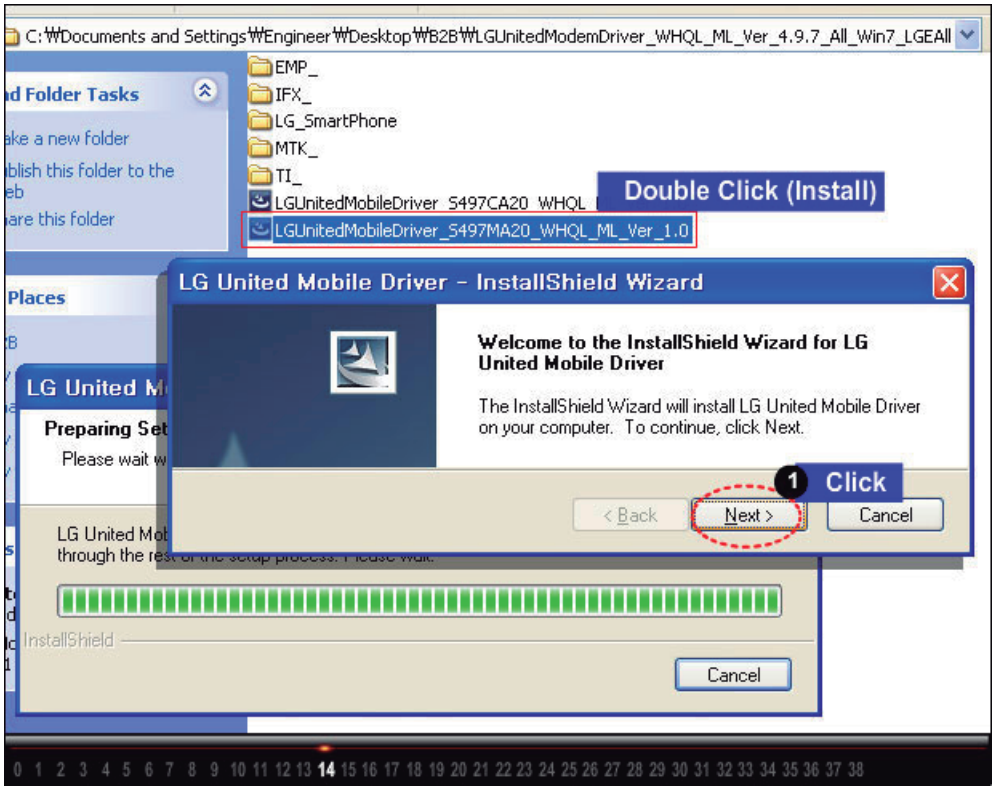


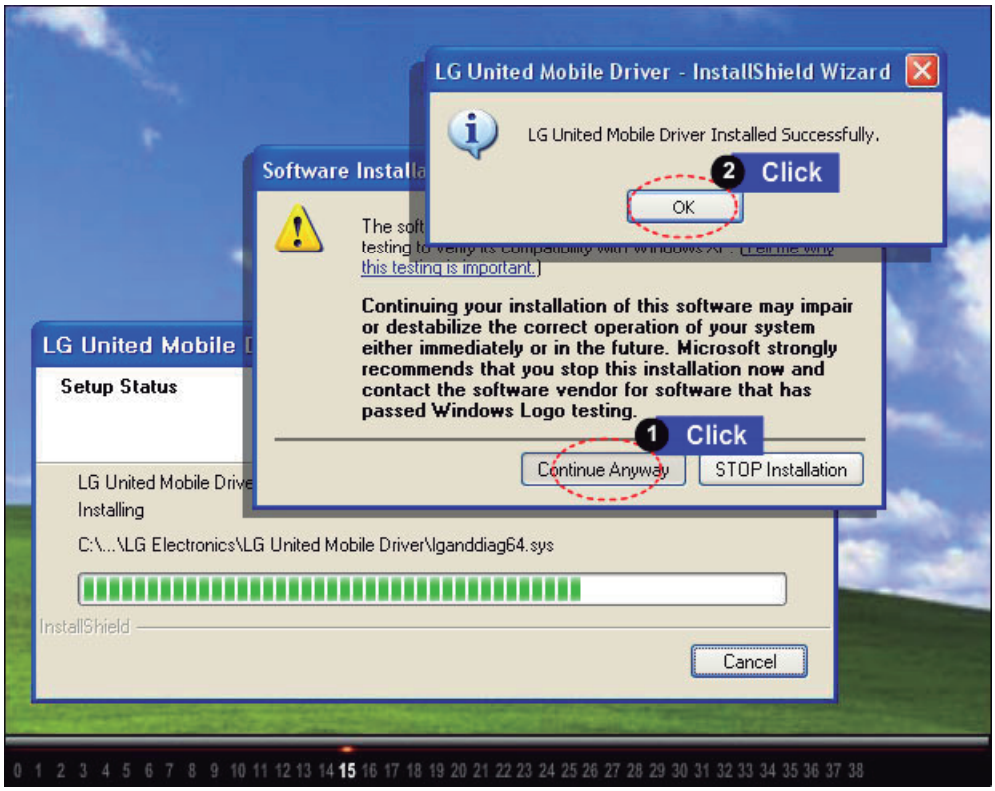


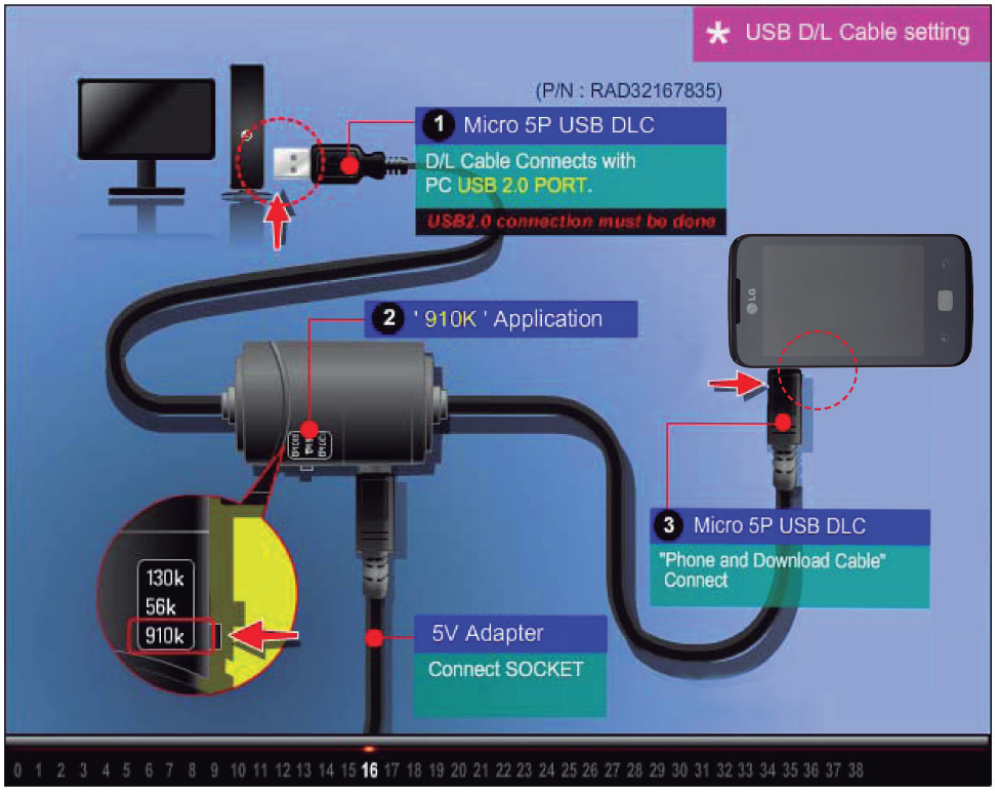


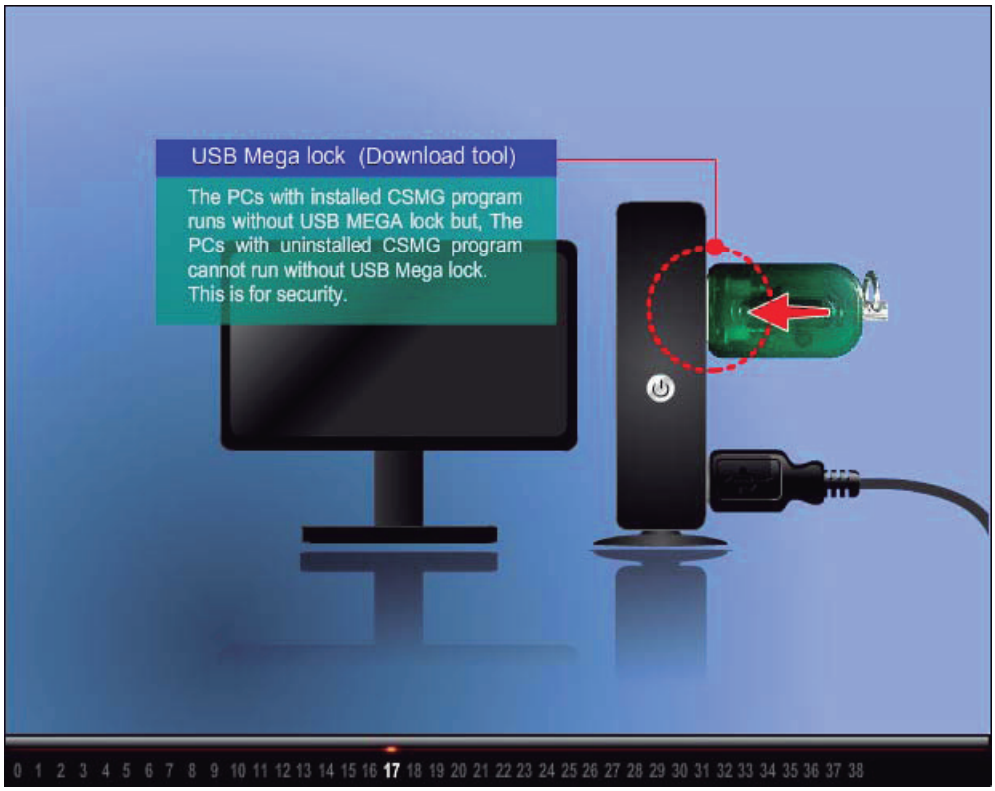


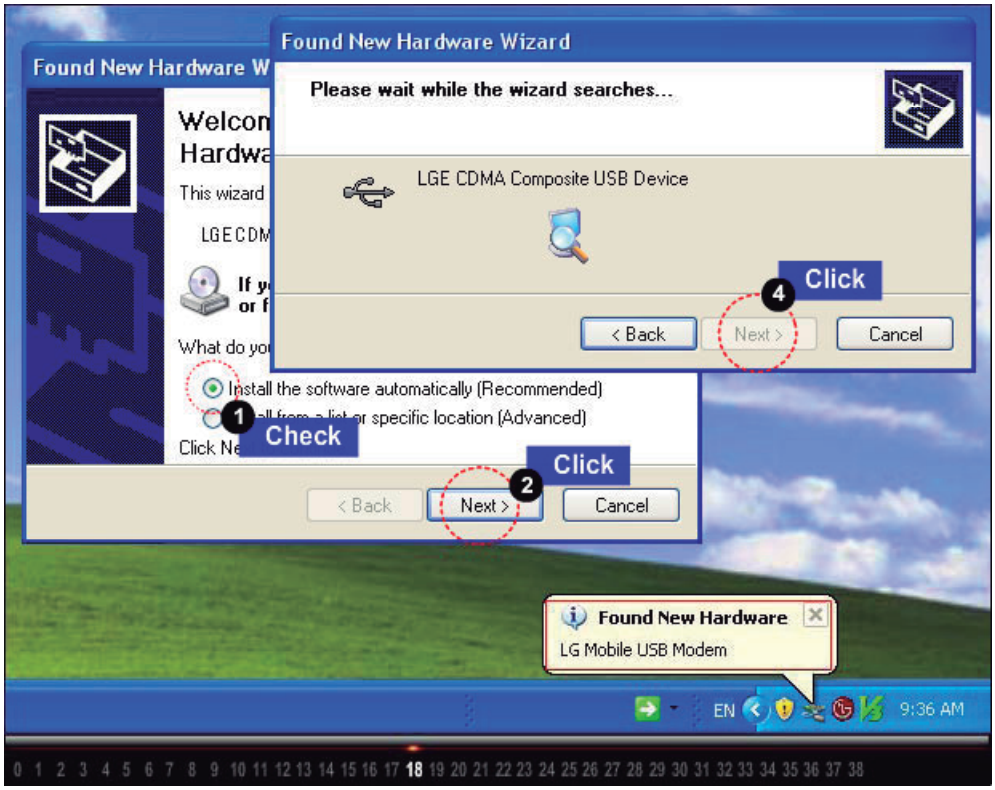


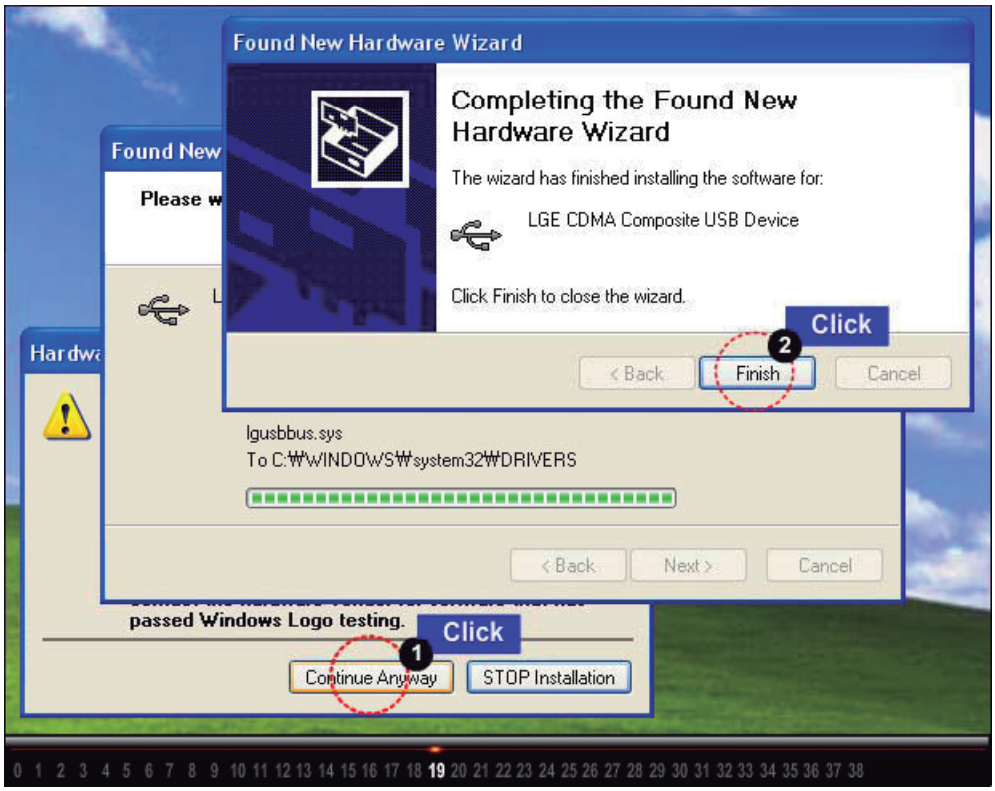


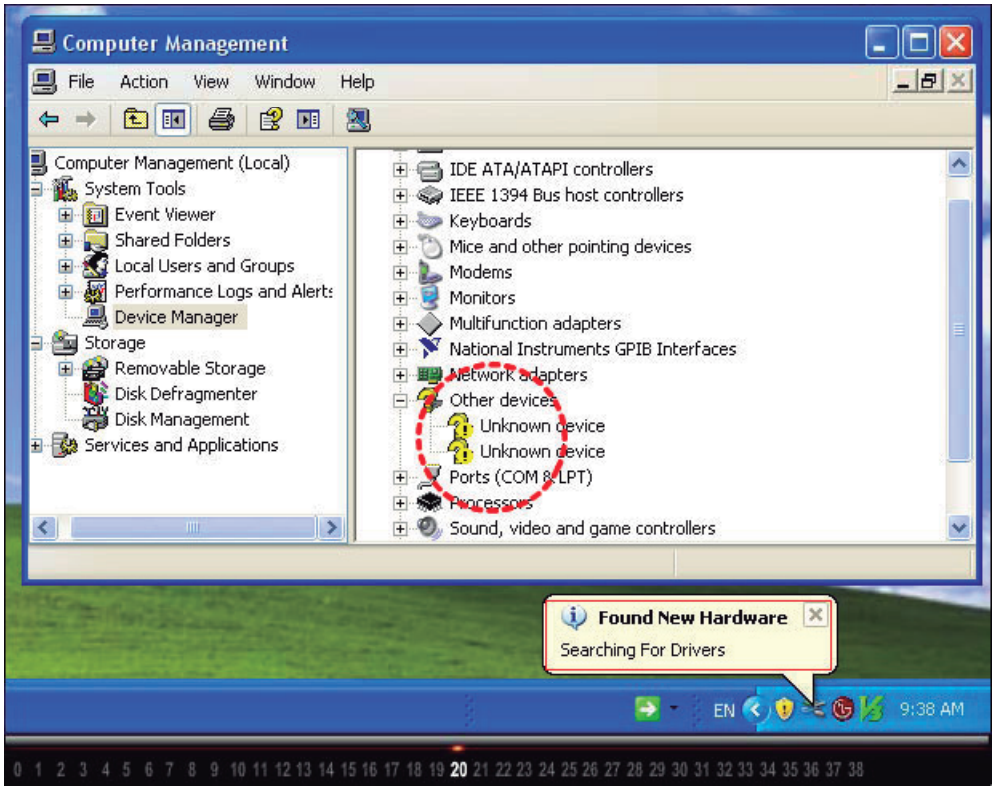


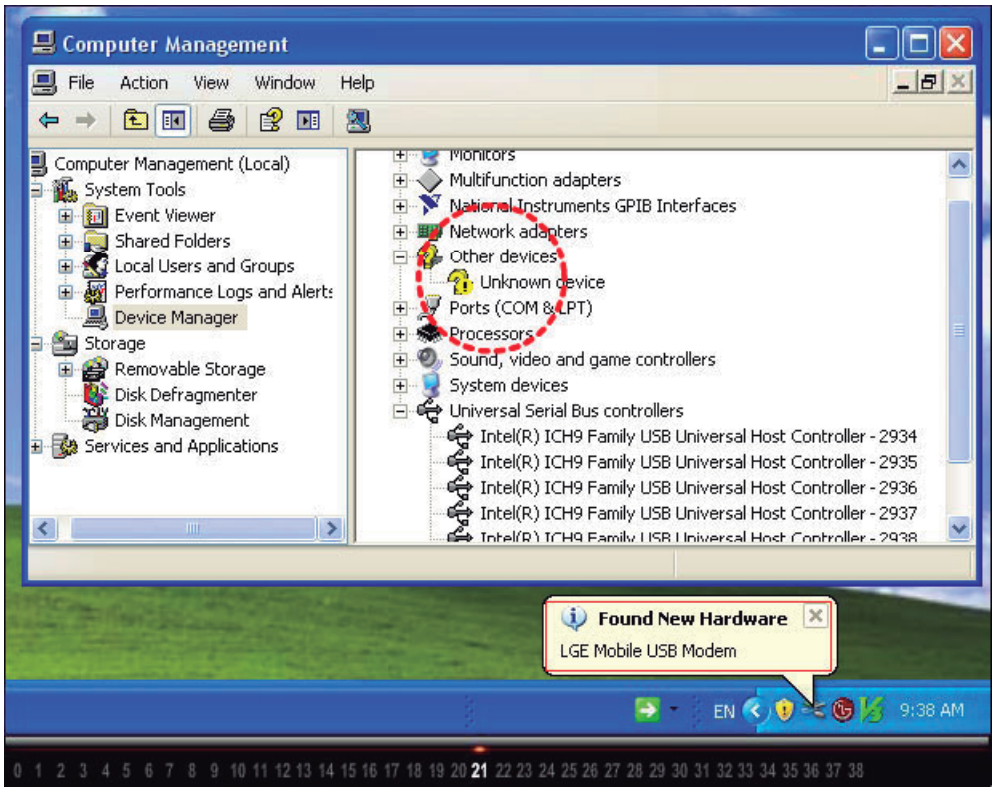


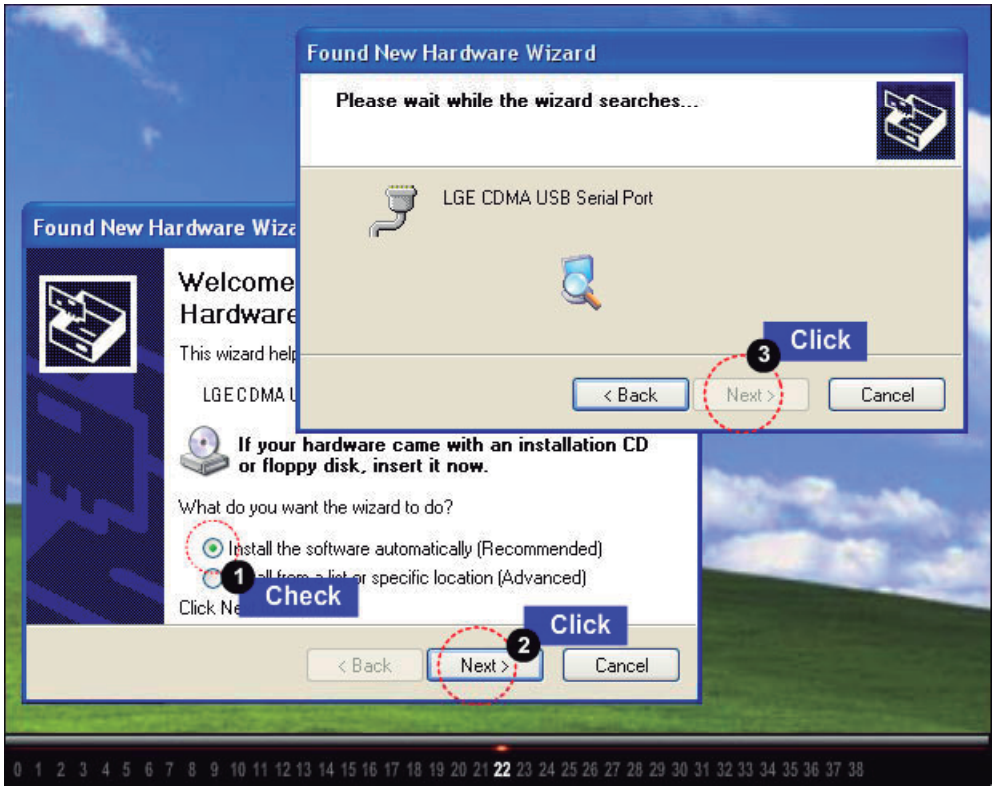


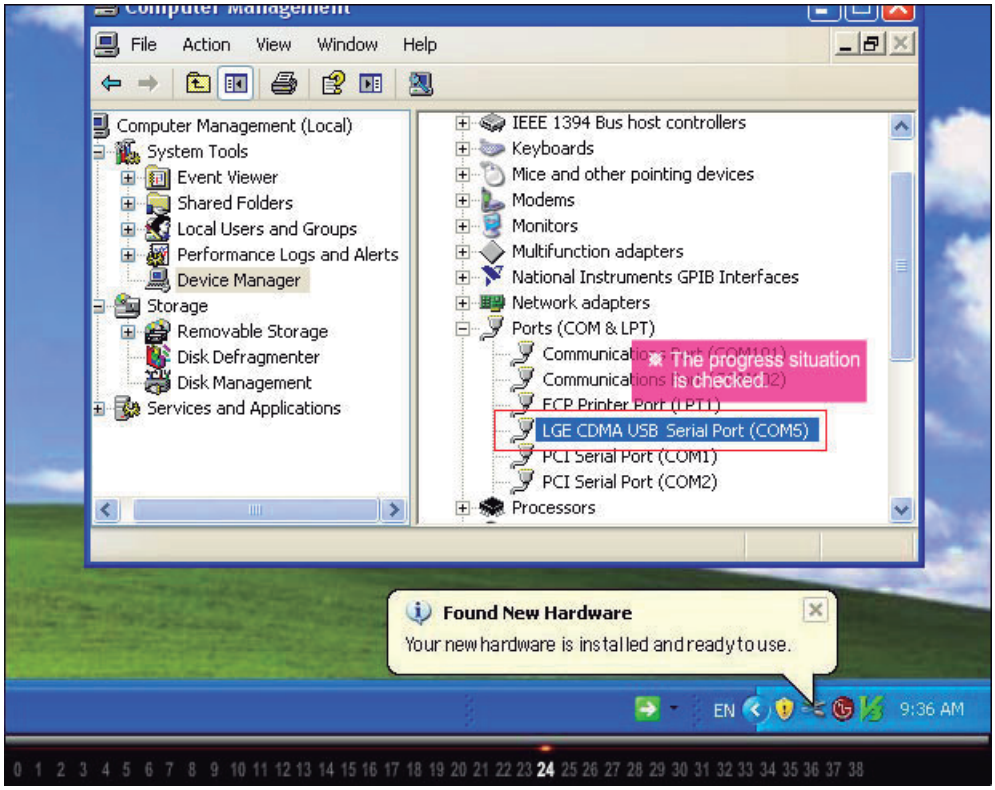


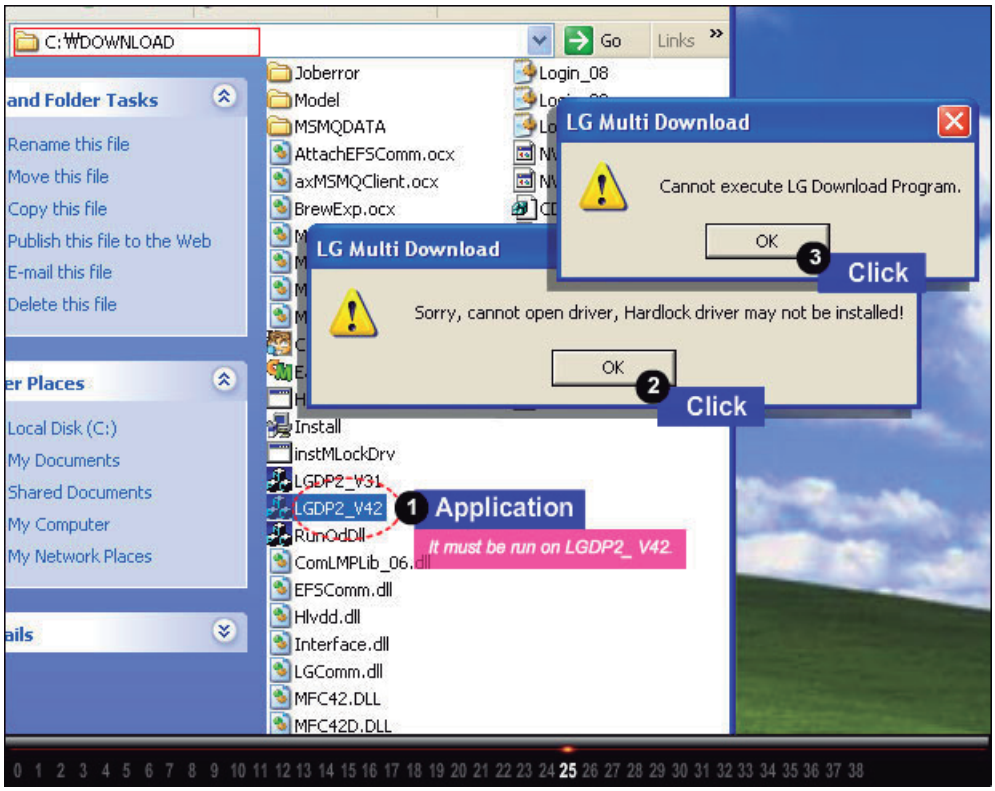


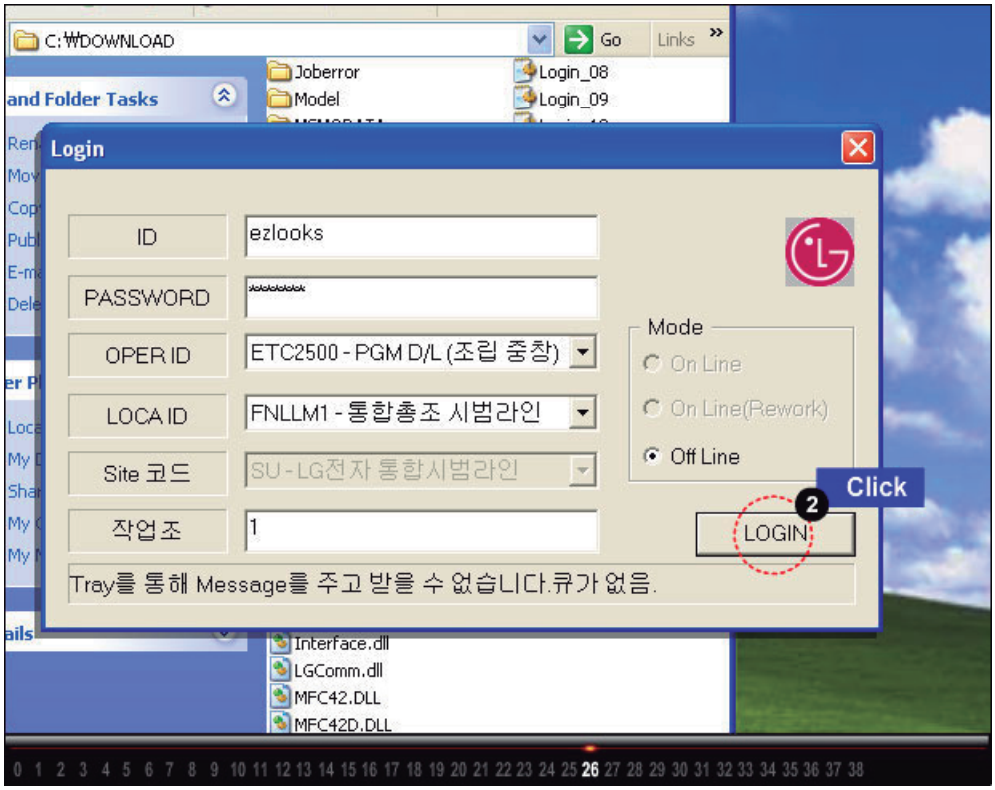


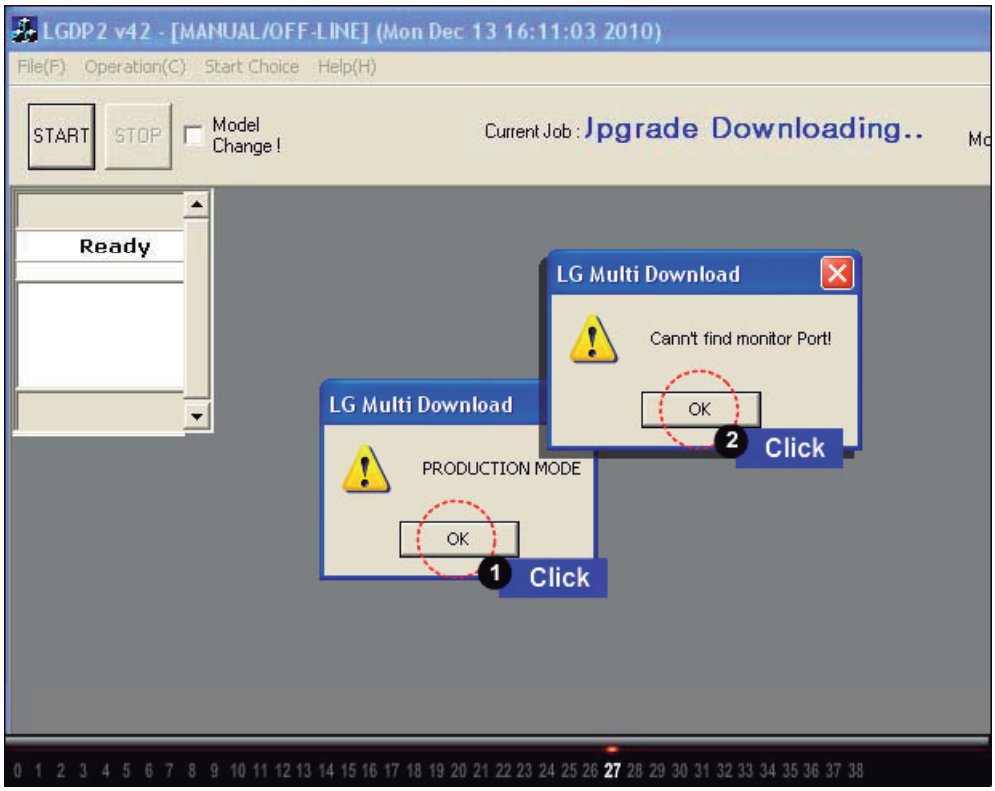


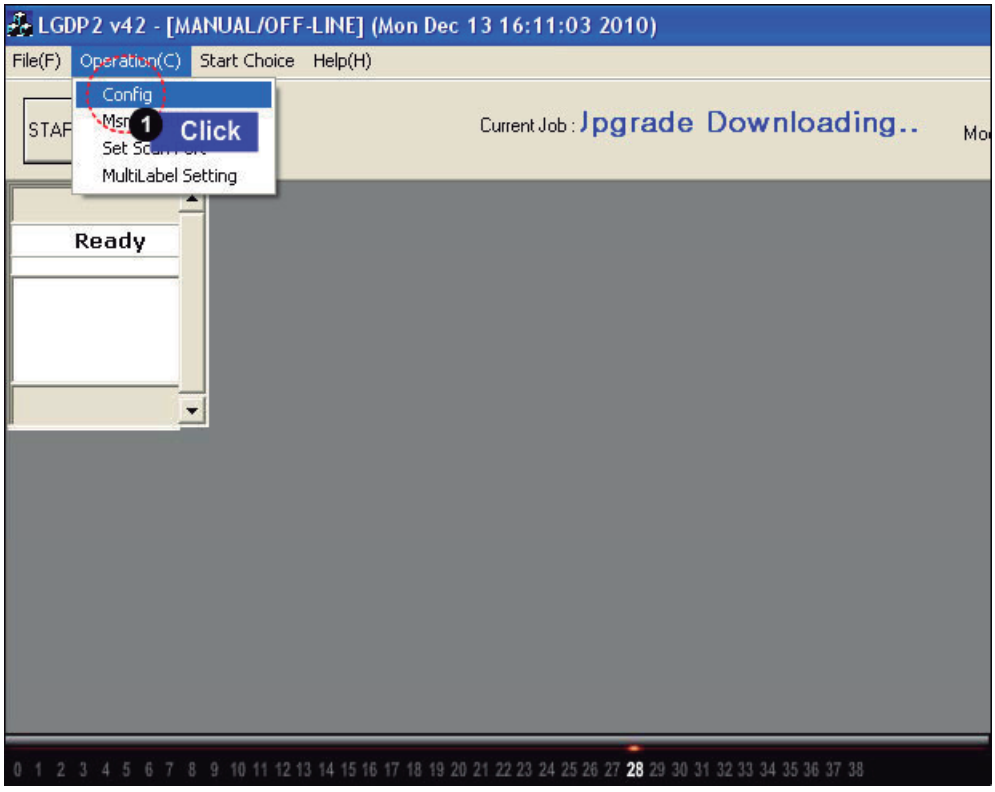


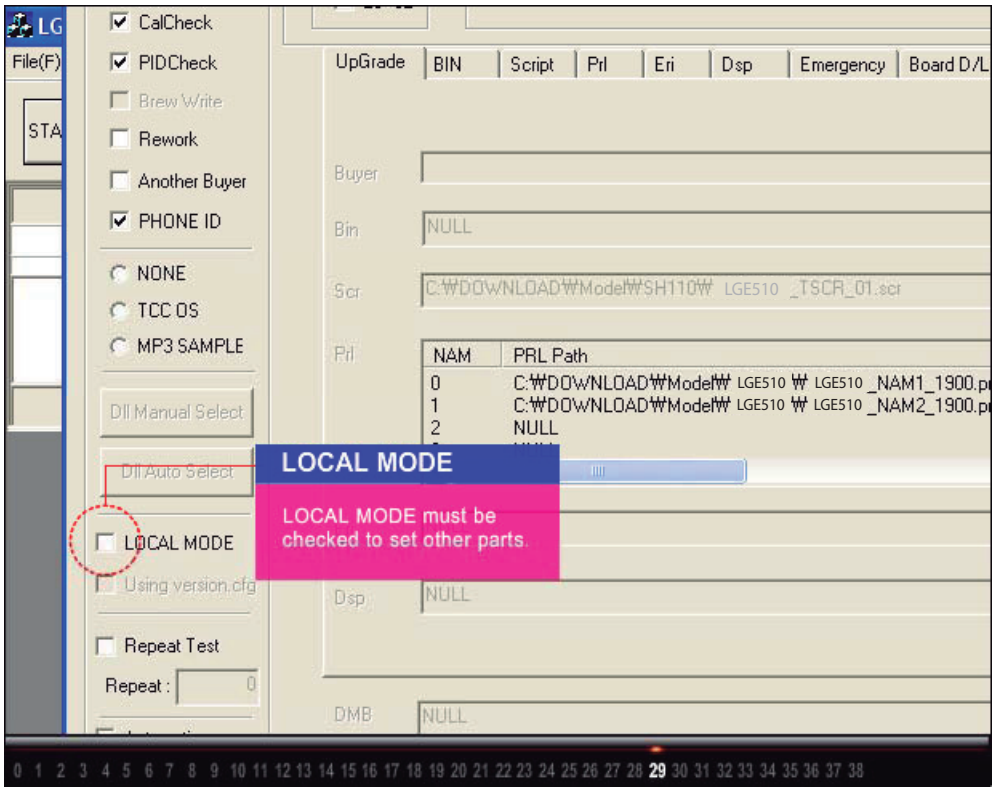


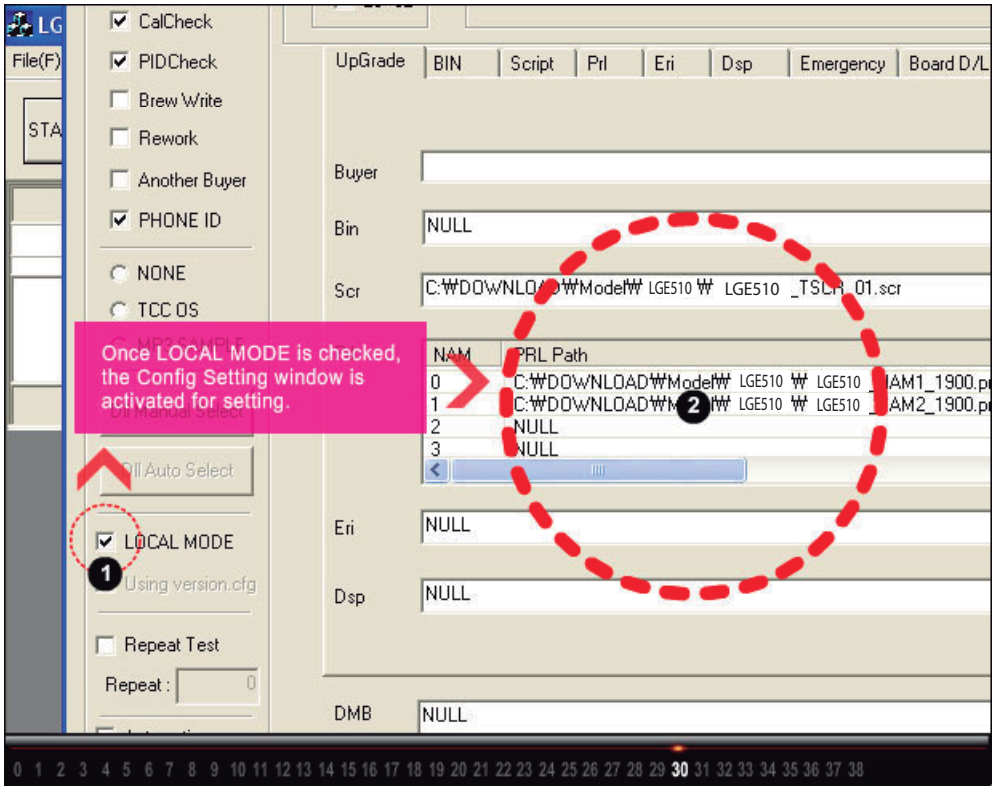


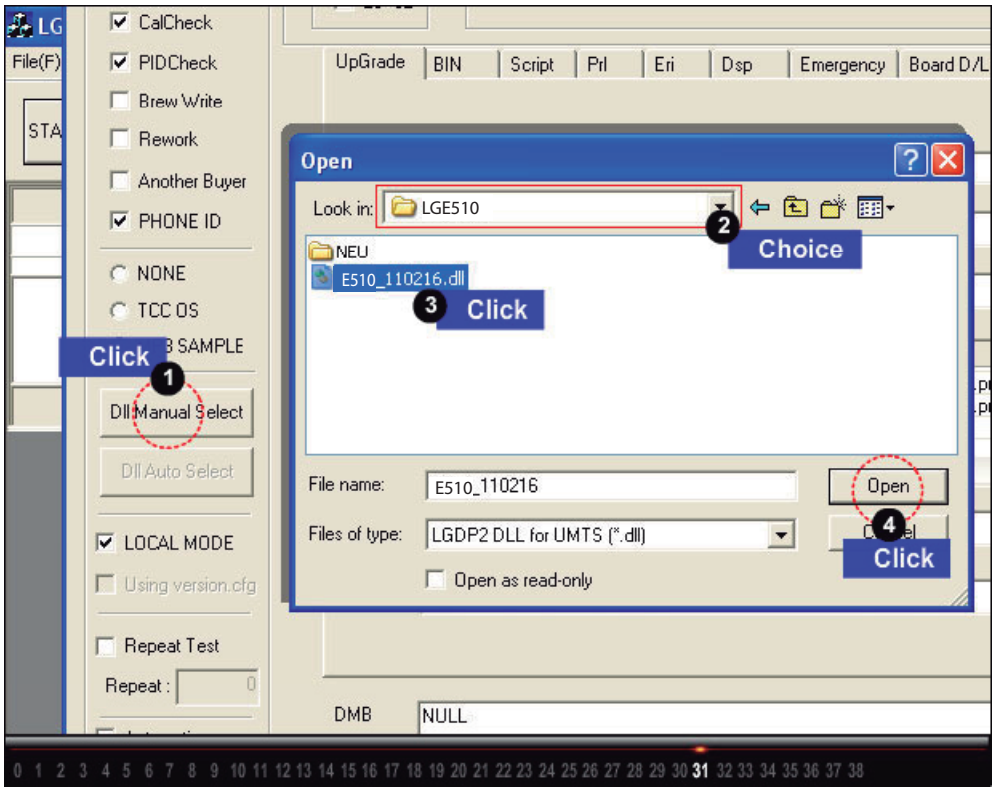


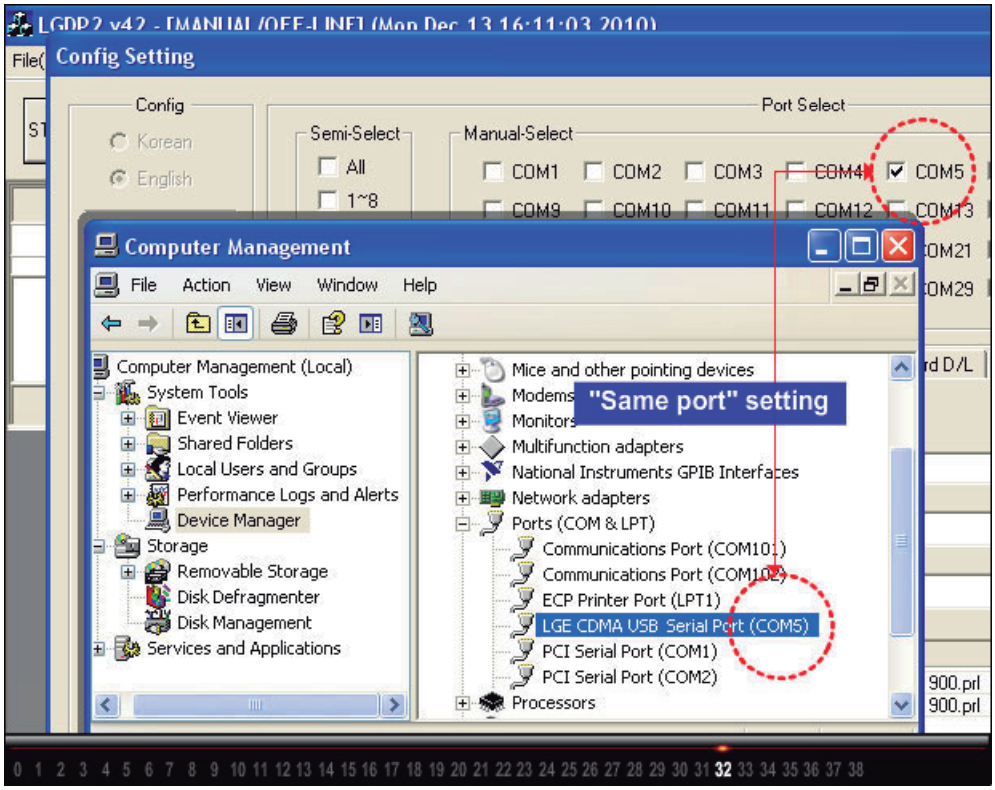


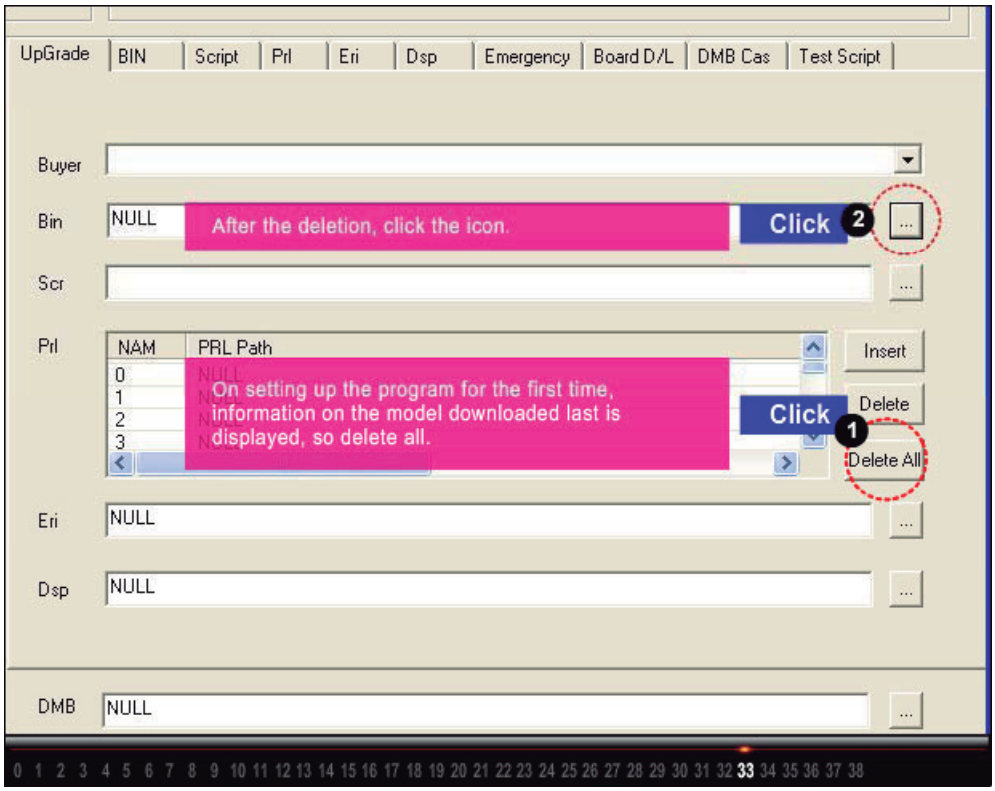


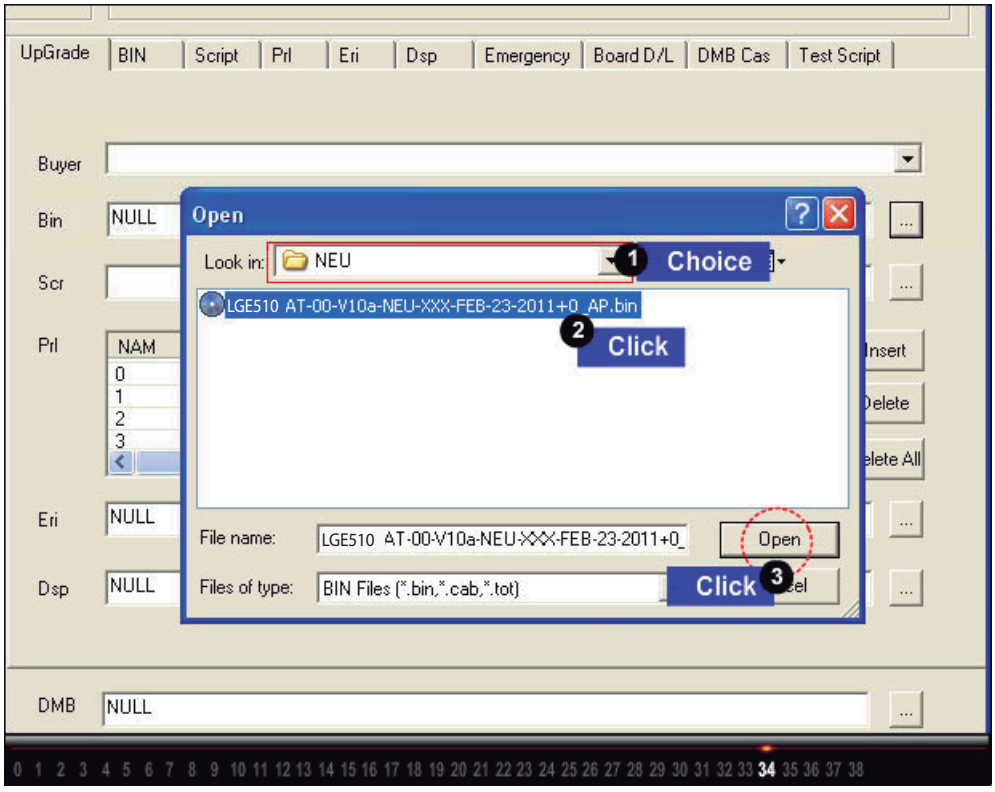


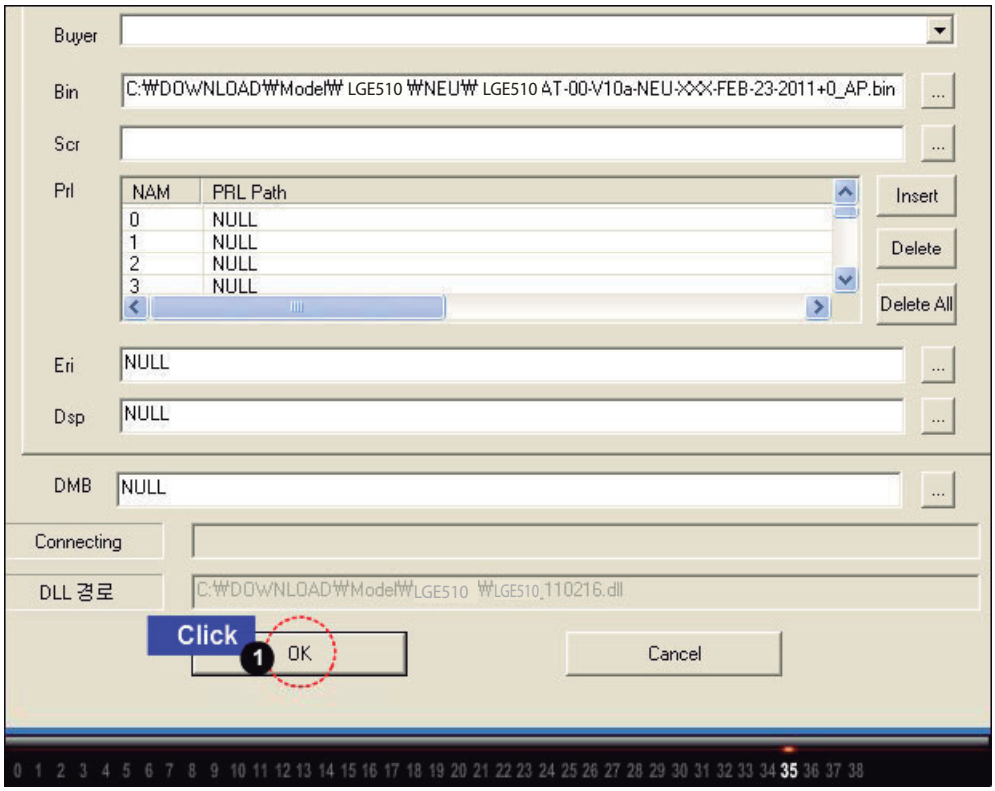


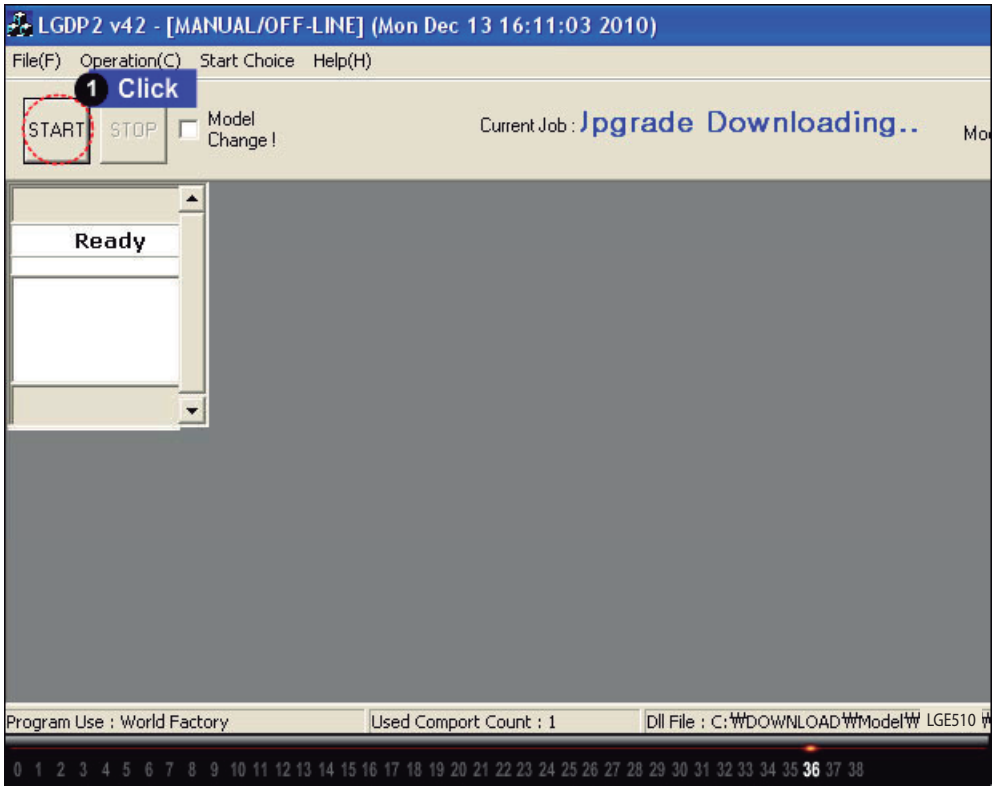


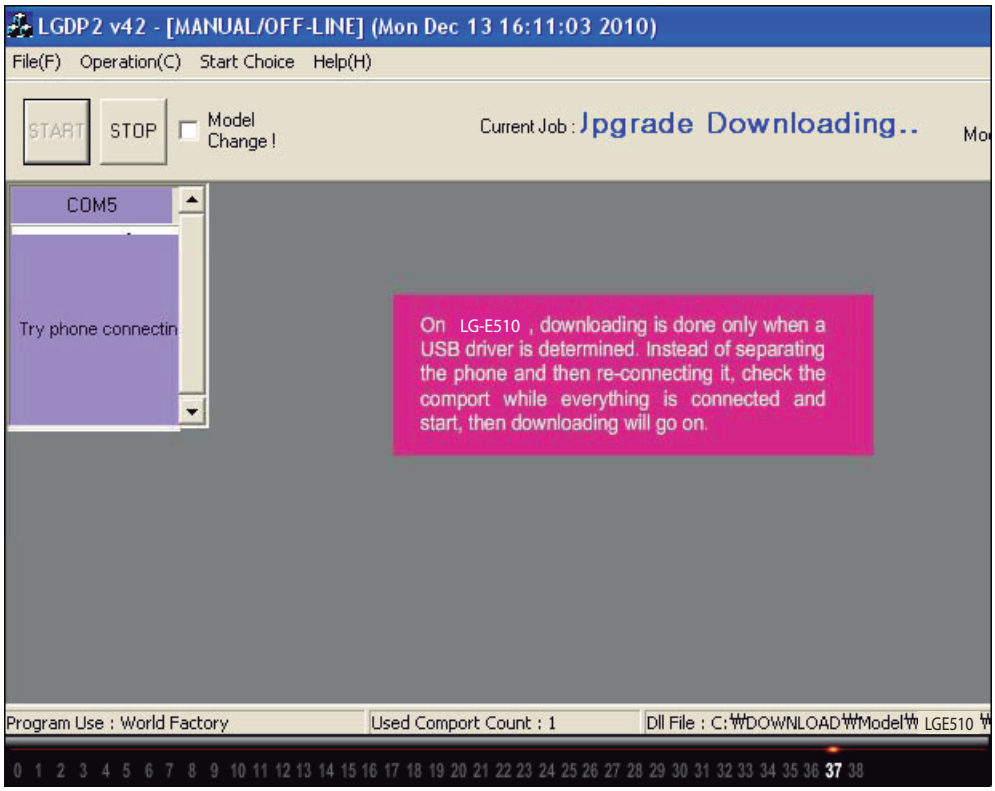


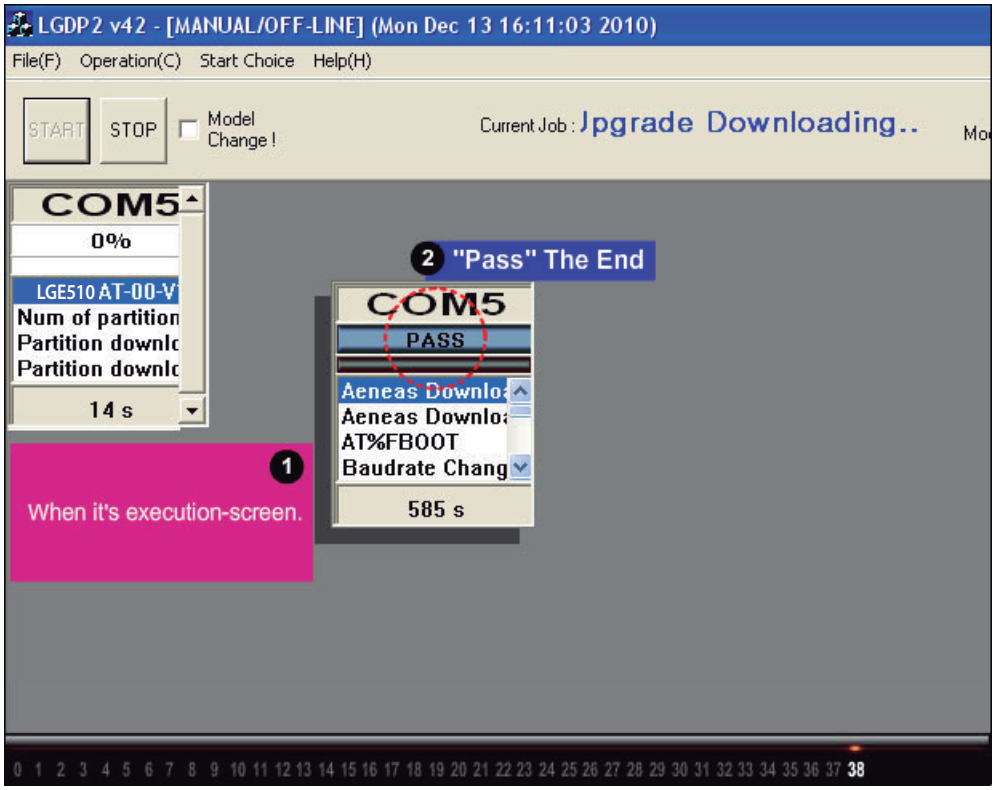






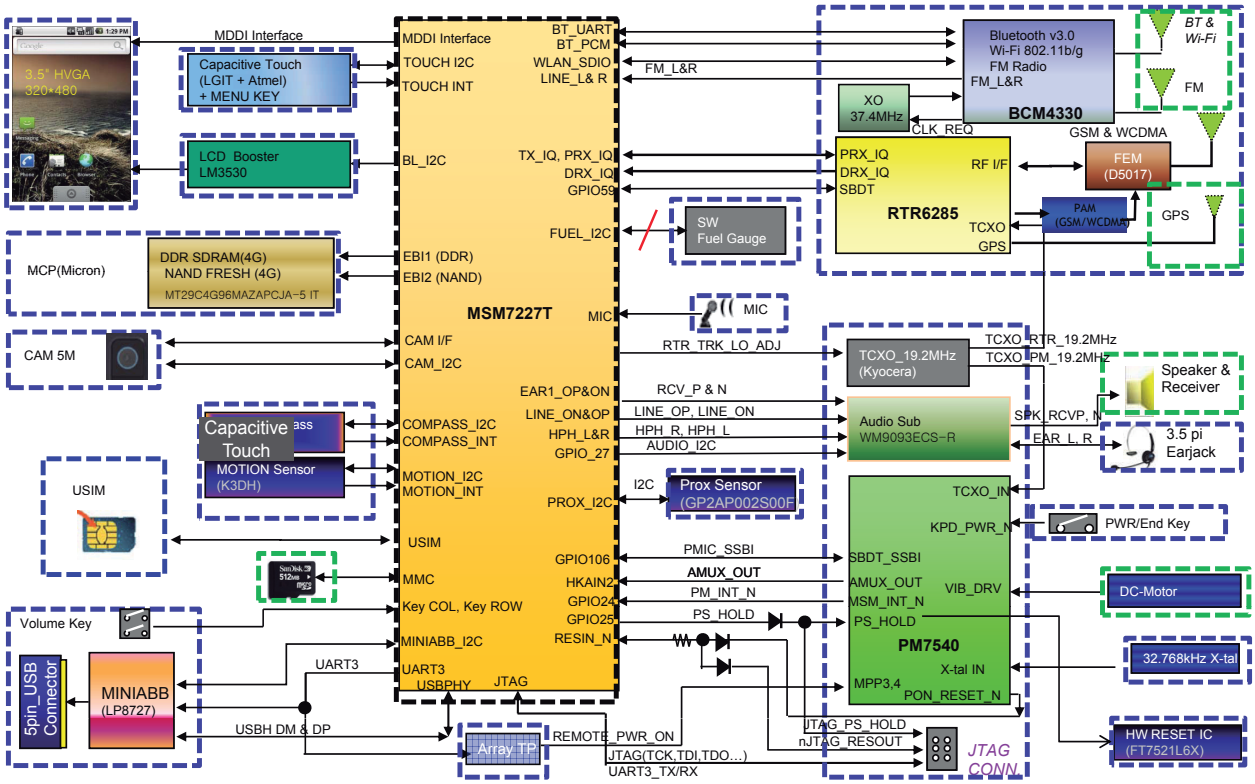




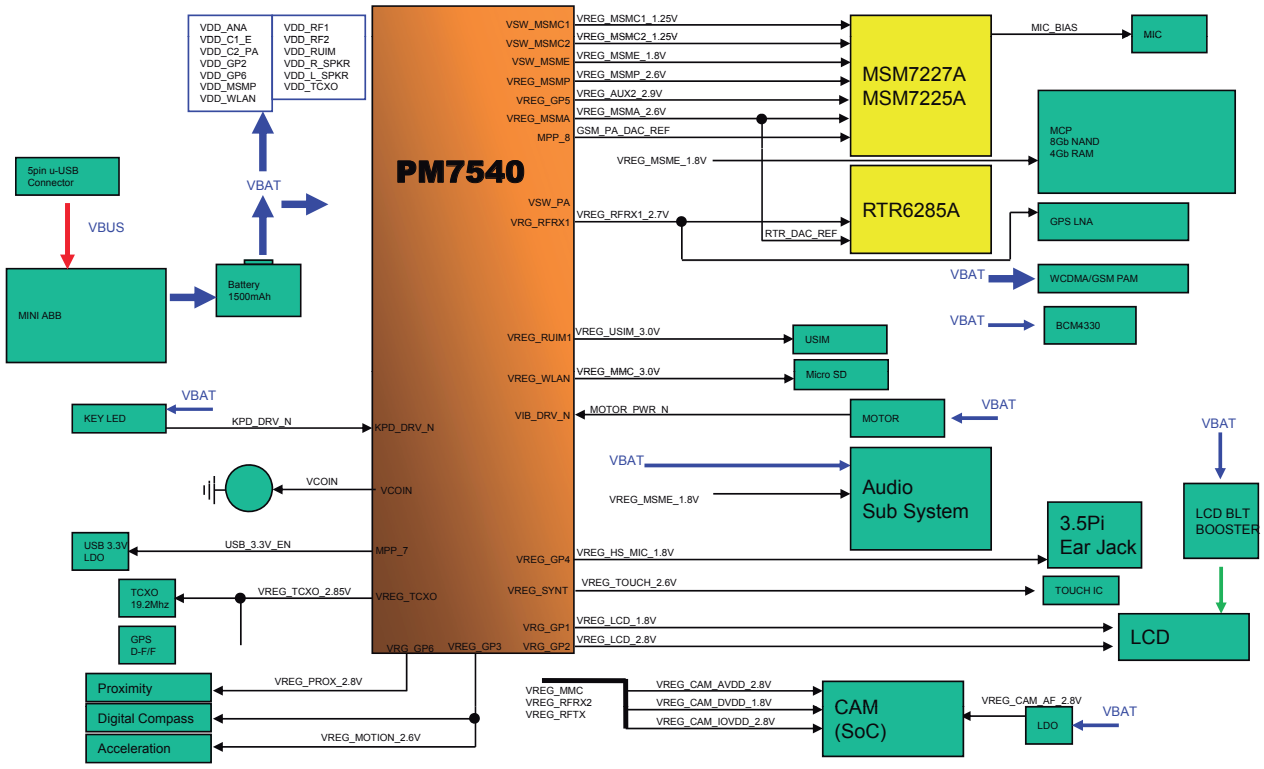


6.BLOCK DIAGRAM

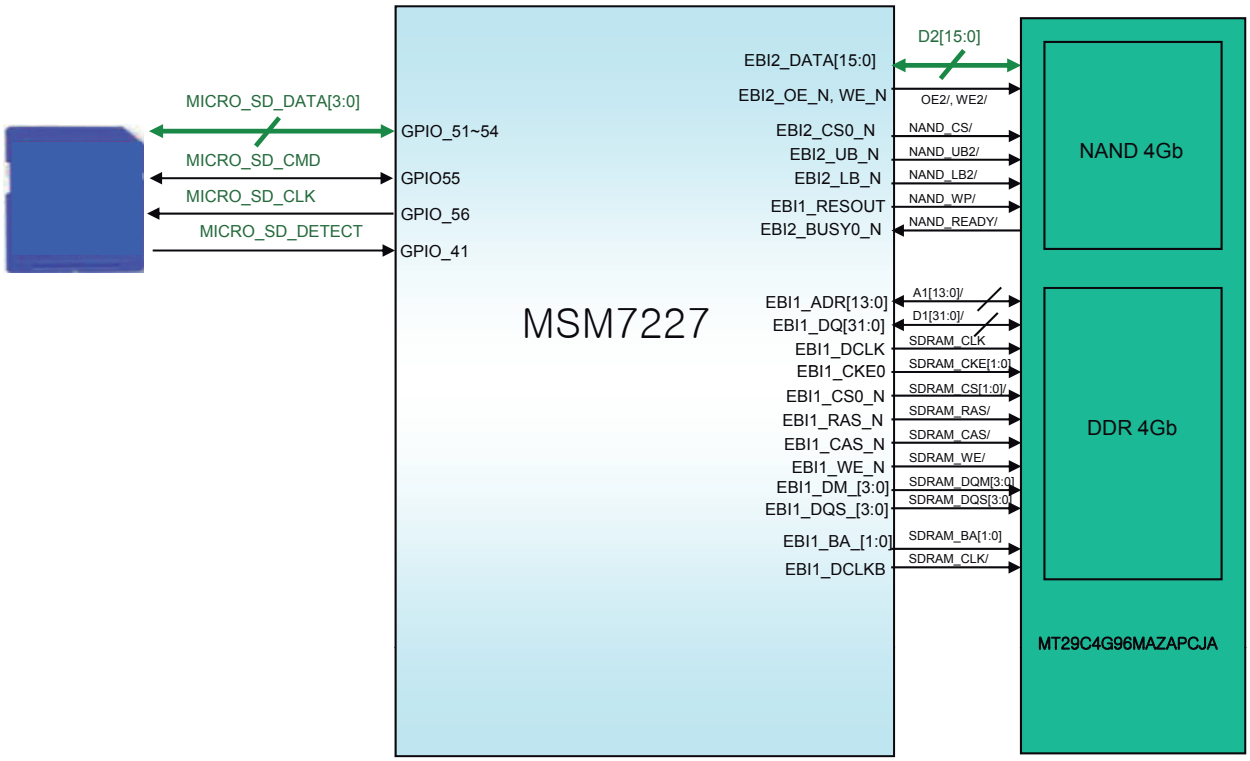
UNIVA(E510) Block Diagram _ TOTAL



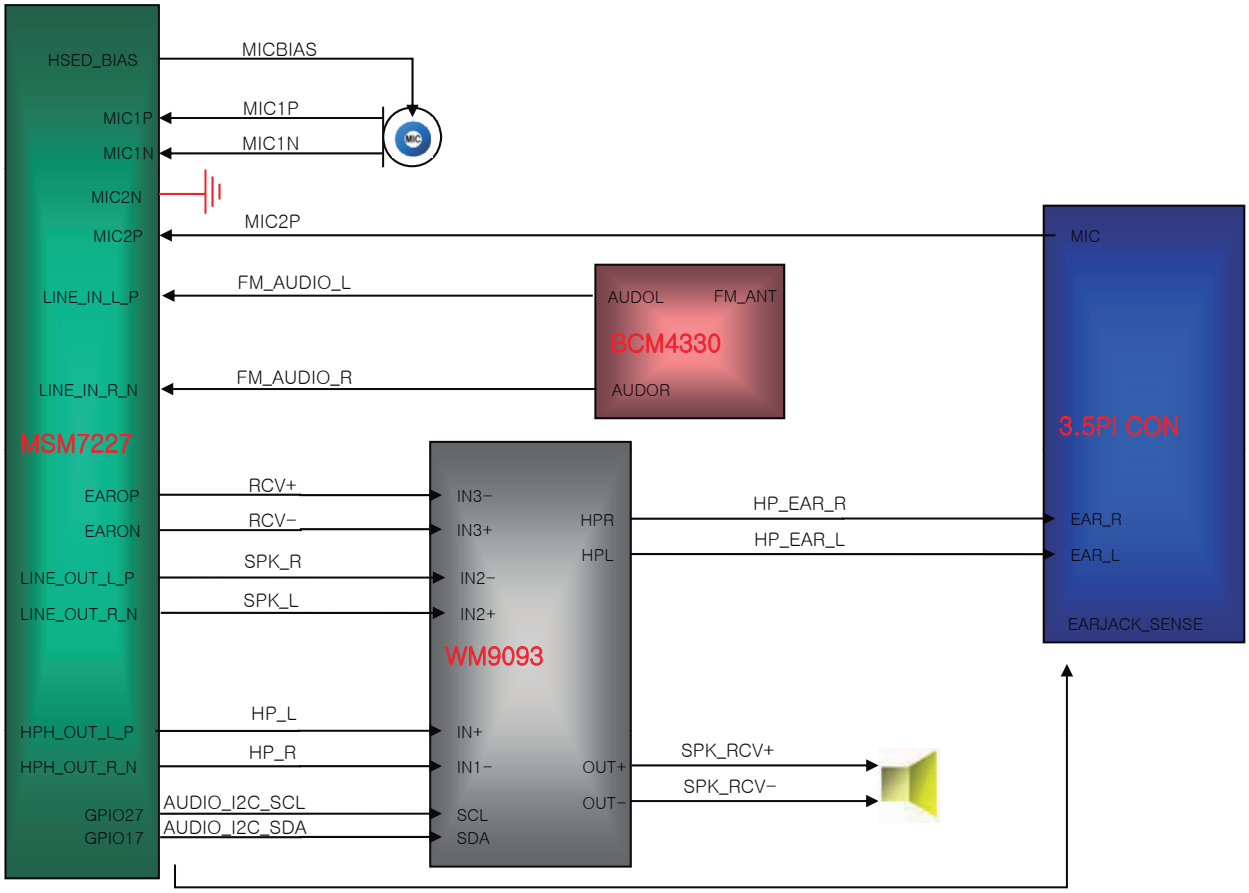
UNIVA(E510) Block Diagram _ POWER



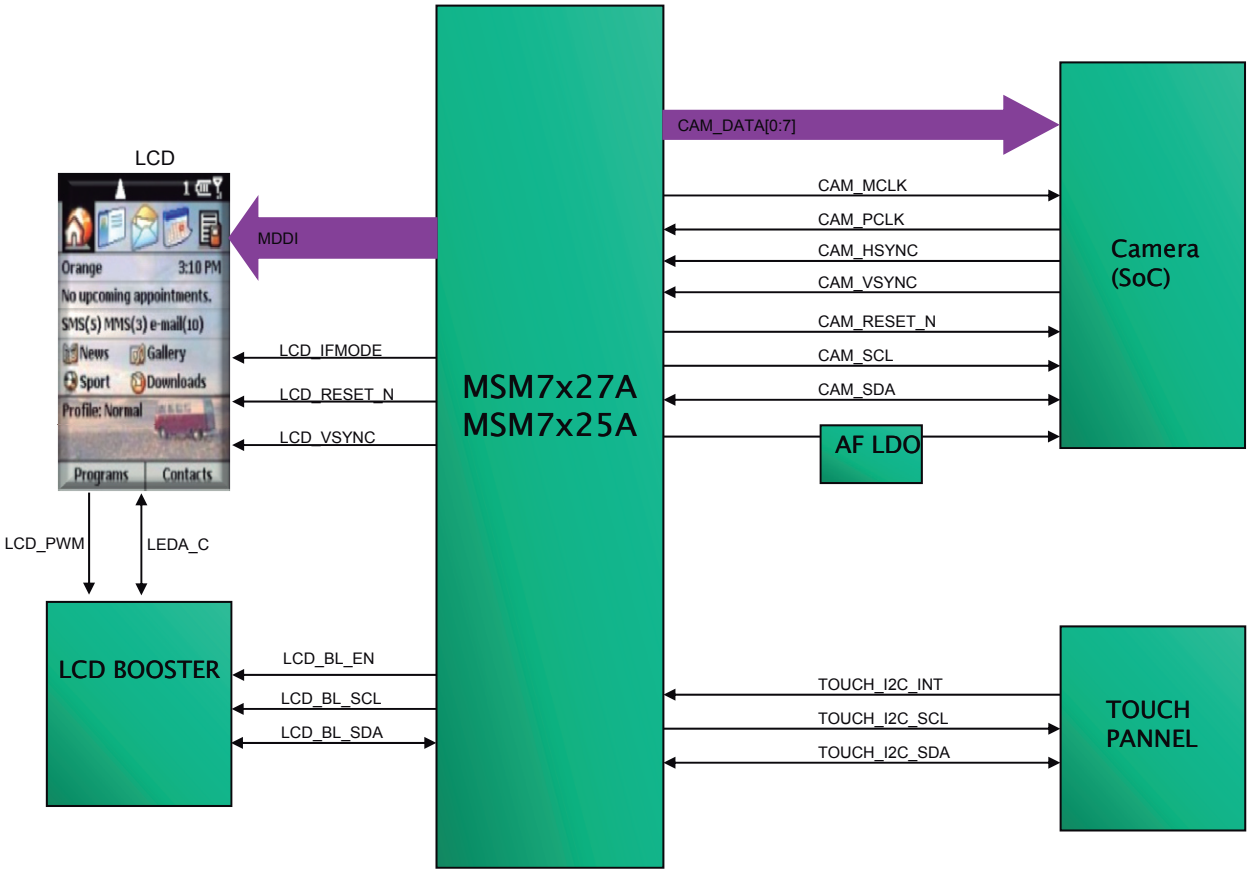
UNIVA(E510) Block Diagram _ MEMORY



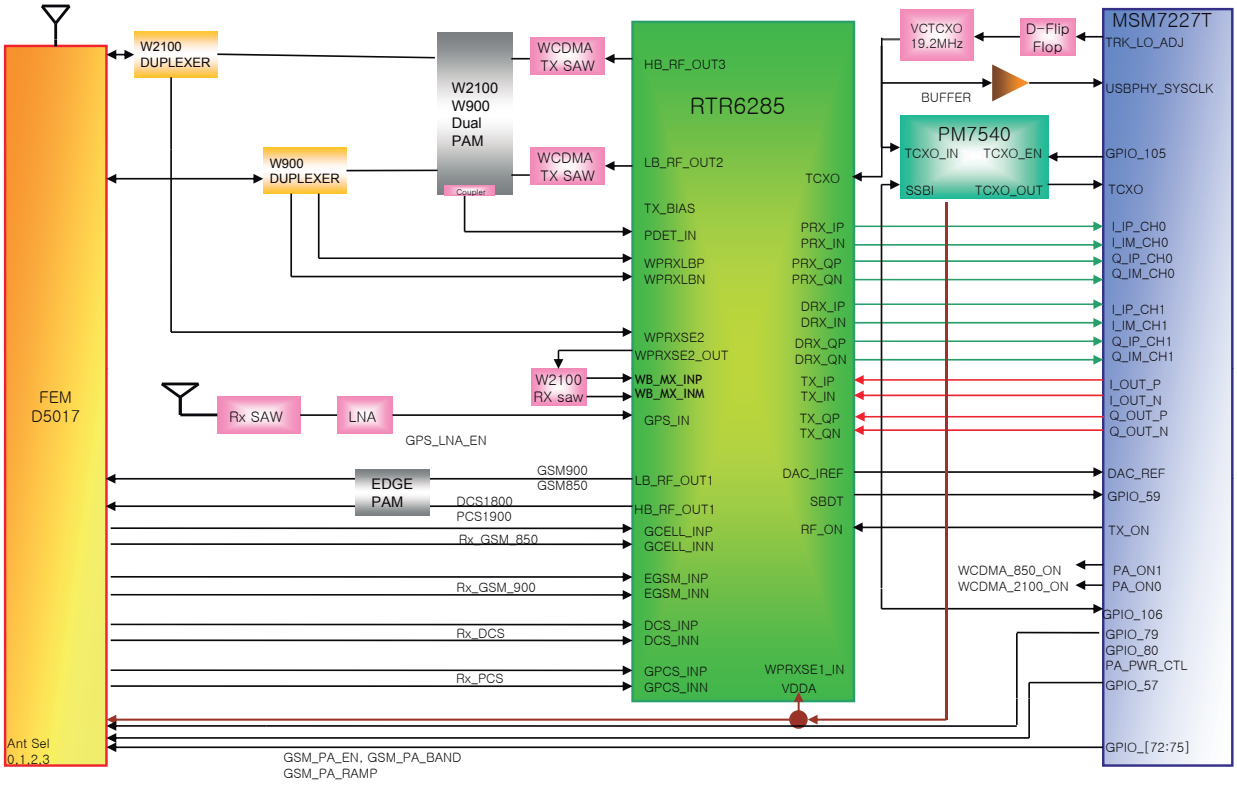
UNIVA(E510) Block Diagram _ AUDIO



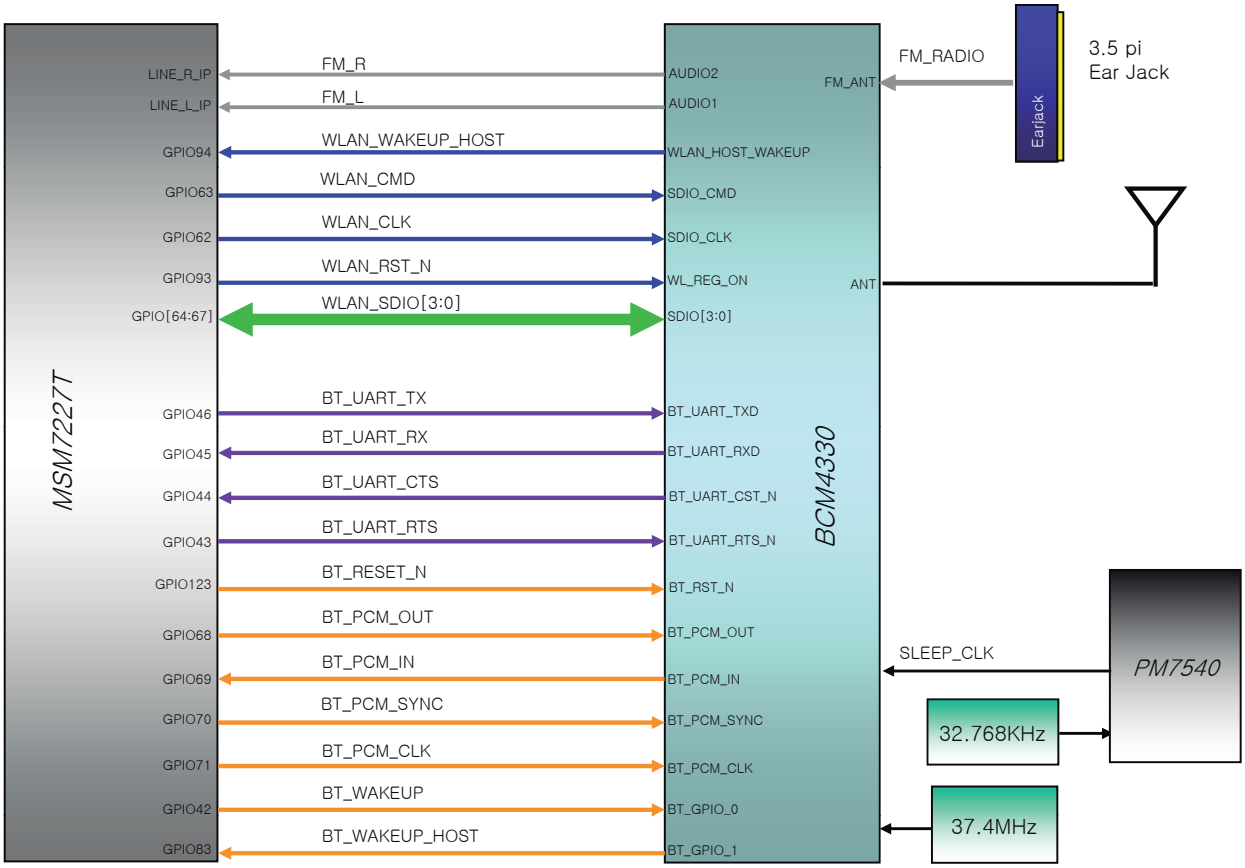
UNIVA(E510) Block Diagram _ LCD/CAMERA/TOUCH



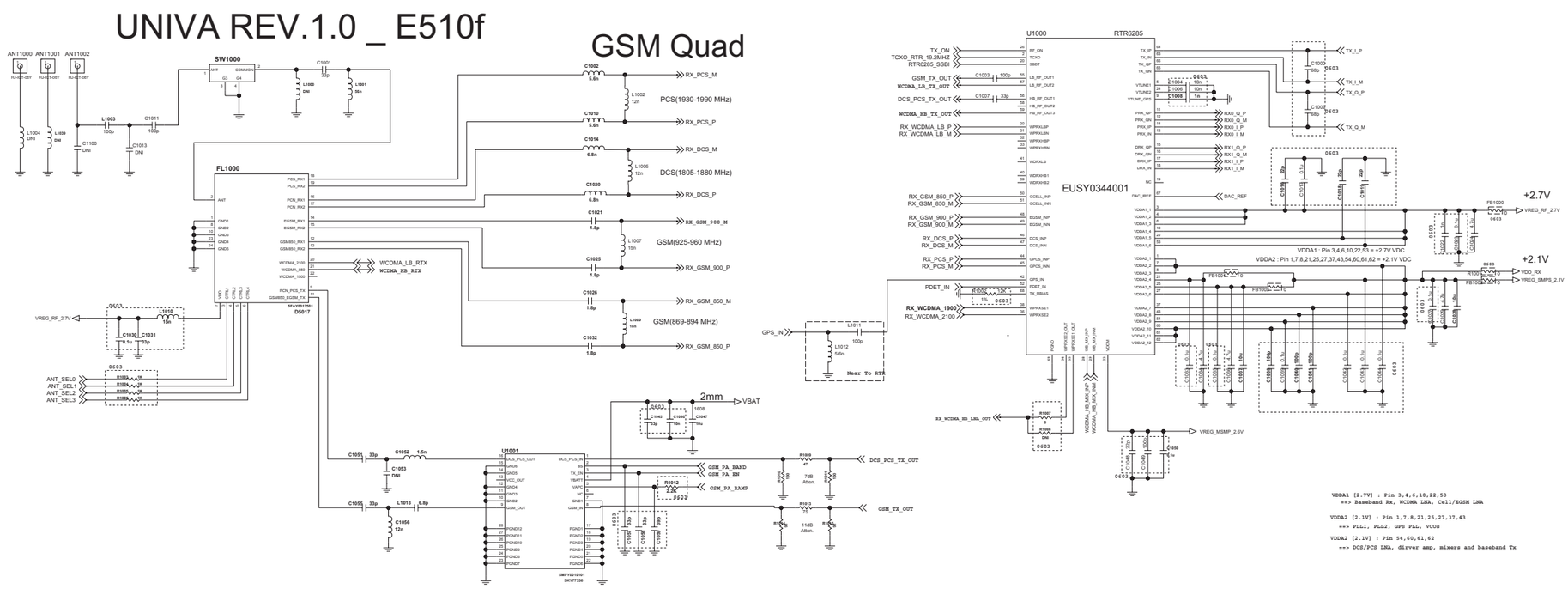
UNIVA(E510) Block Diagram _ RF

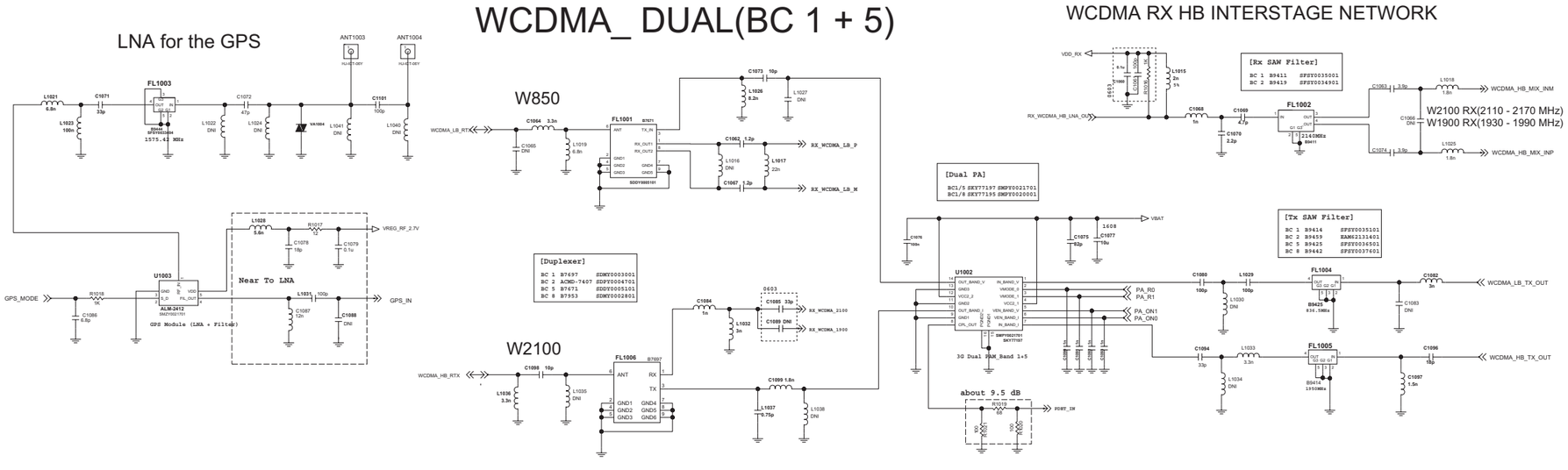


UNIVA(E510) Block Diagram _ WIFI/BT/FM

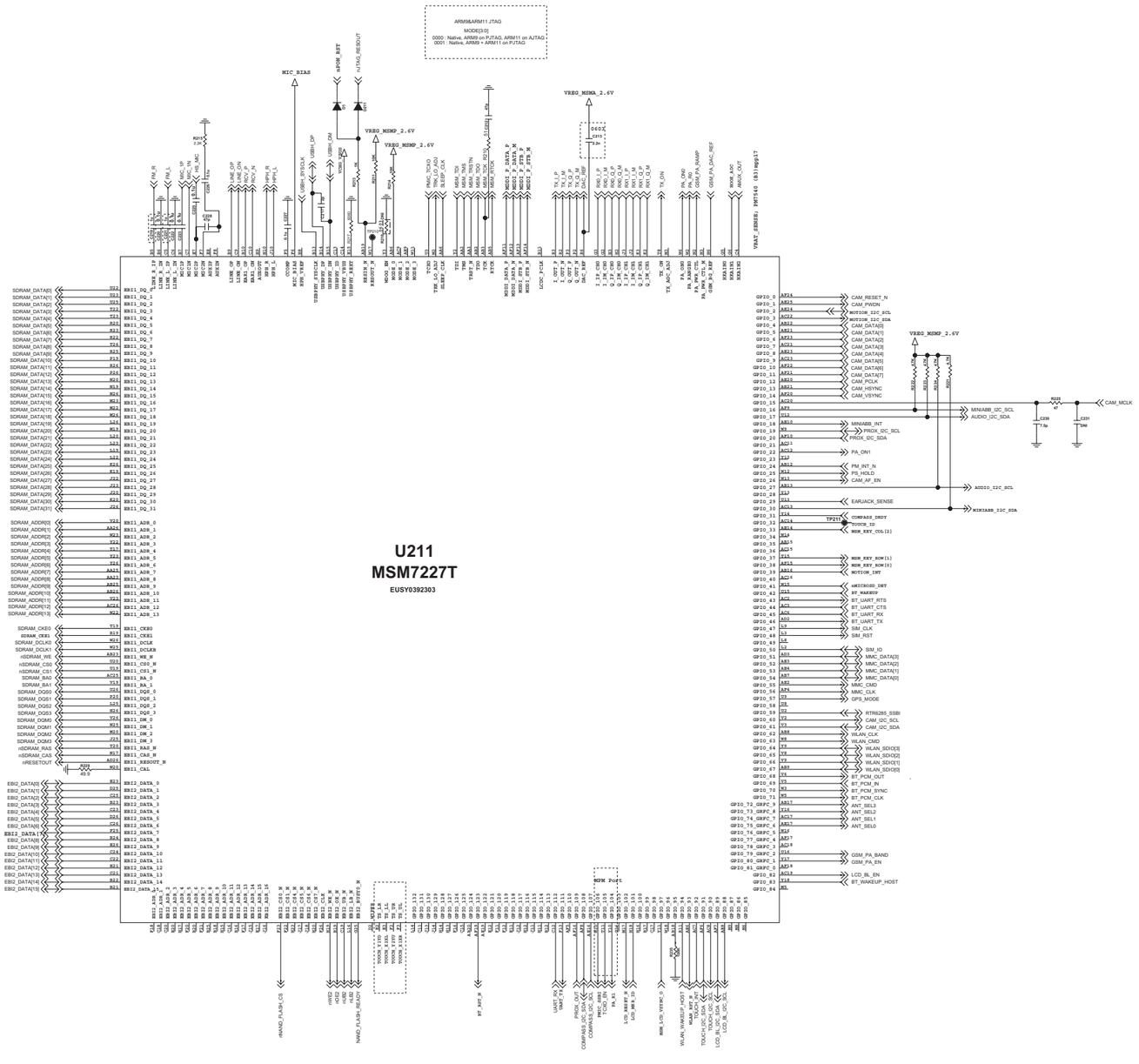


7. CIRCUIT DIAGRAM

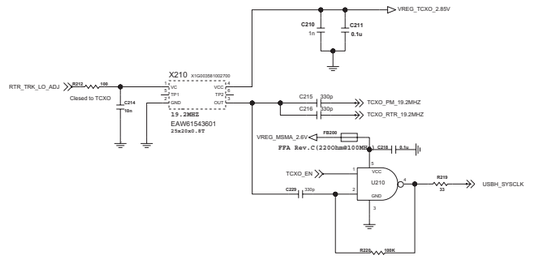




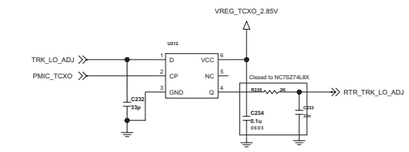
MSM7227T Logic Part



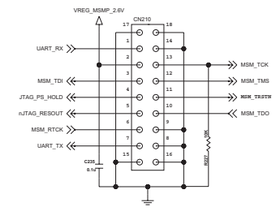
TCXO Circuit



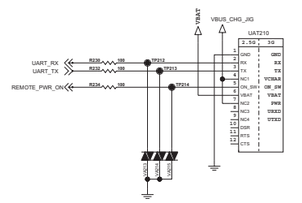
GPS D FLIP-FLOP



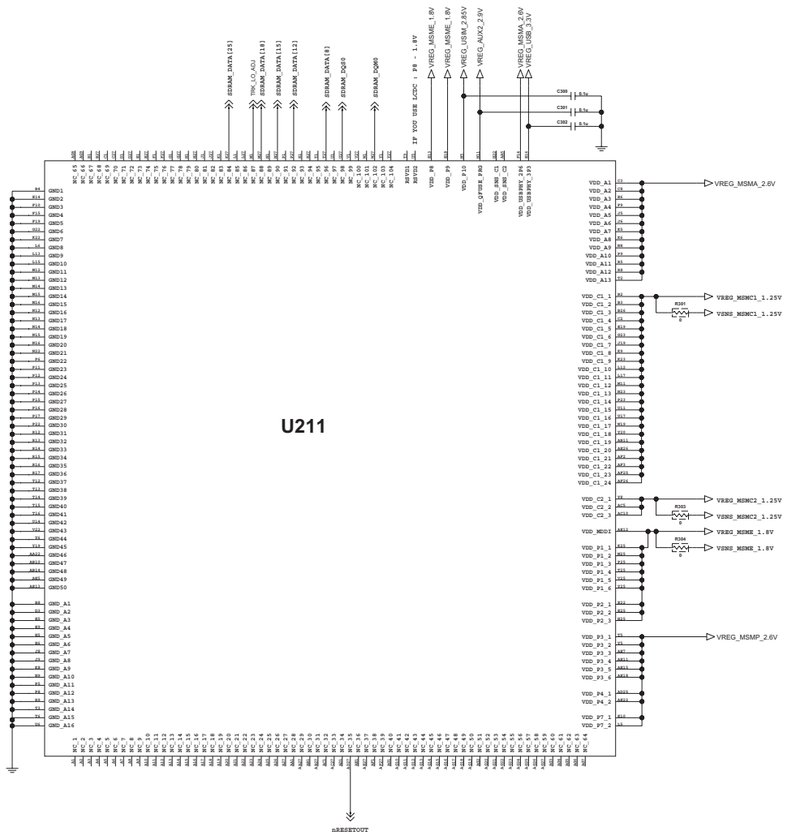
ARM9&ARM11 JTAG



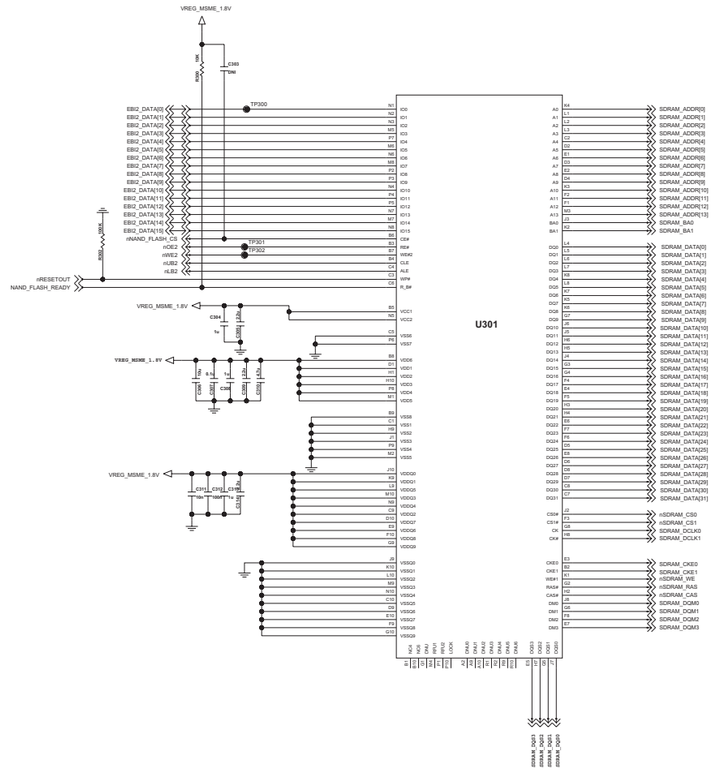
Array TP Nest JIG



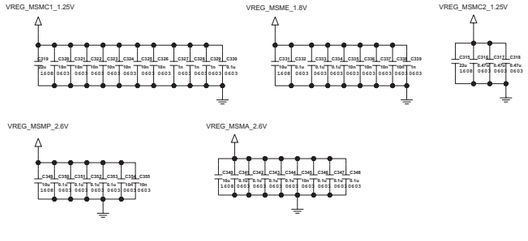
MSM7227 Power Part



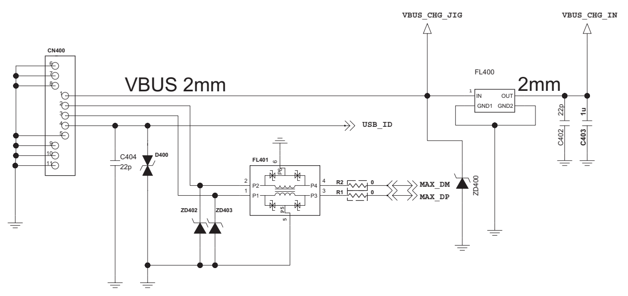
MCP (4G NAND FLASH +4G DDR SDRAM)



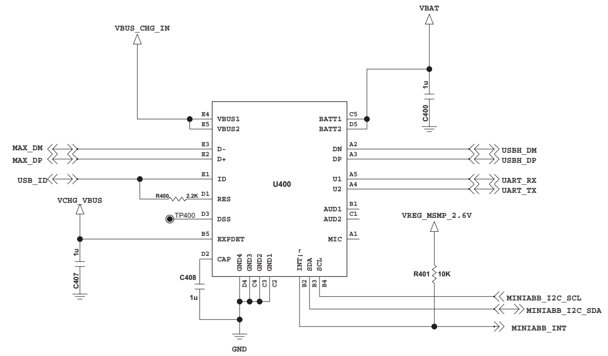
Cap for MSM7227 Power



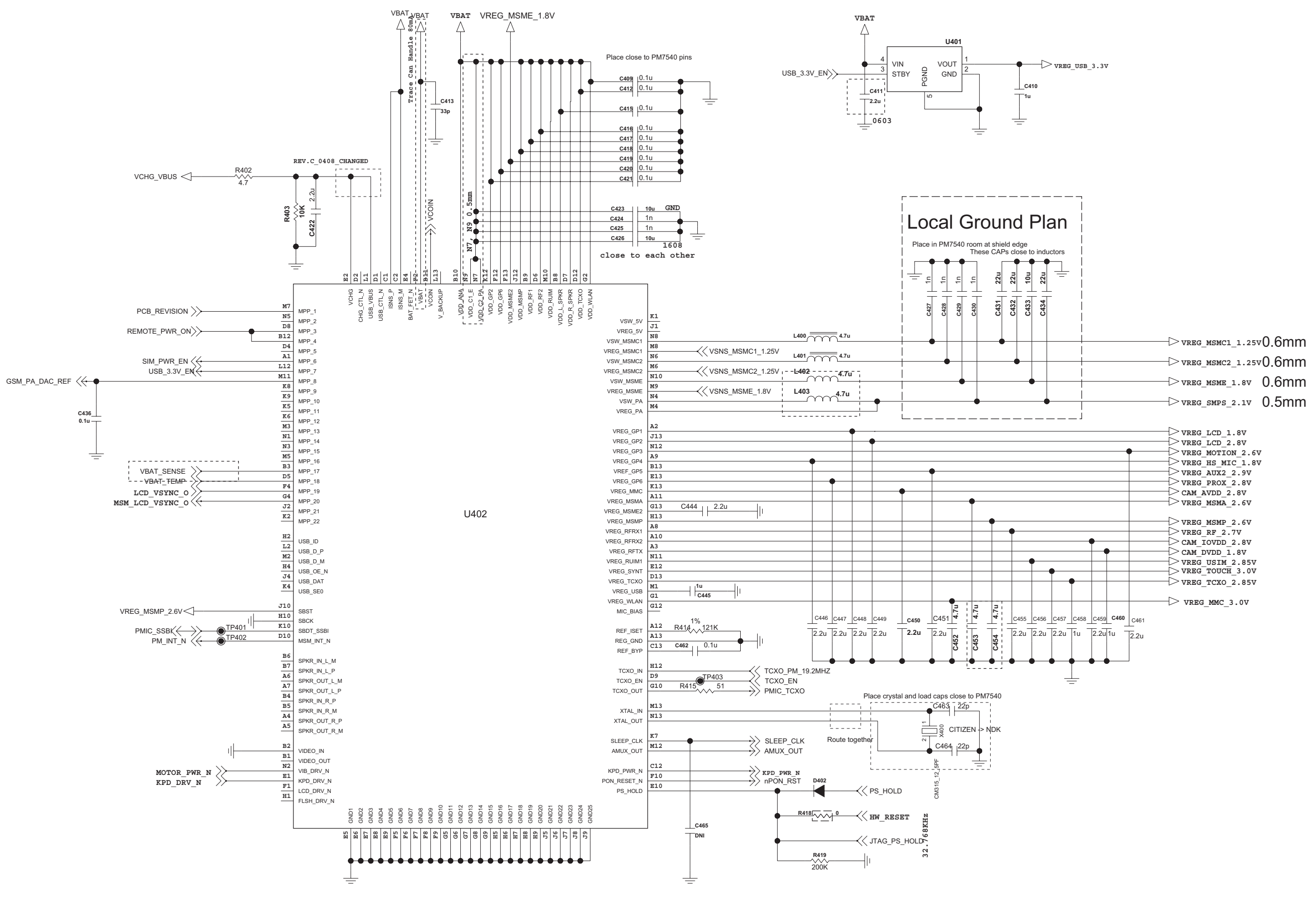
u-USB Connector

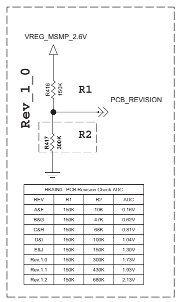


Mini ABB_RT

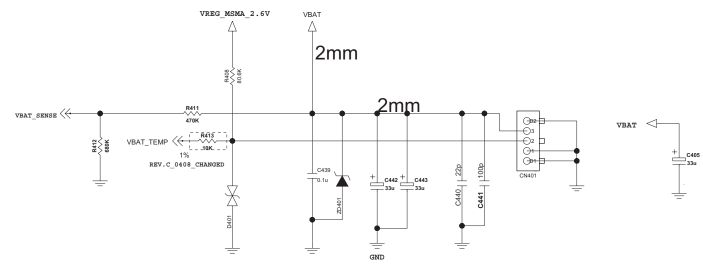


PM7540





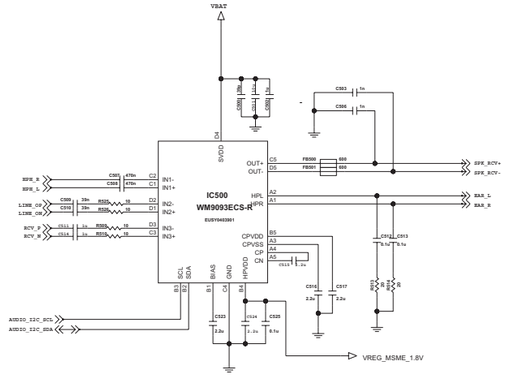
Battery Conn.



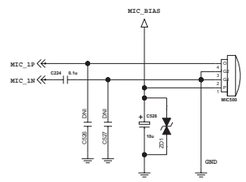
Must Check Battery Conn. Pin Map

AUDIO

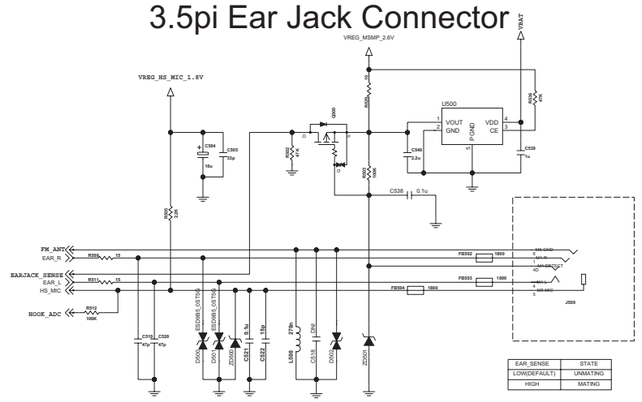
Audio SUB SYSTEM



MIC

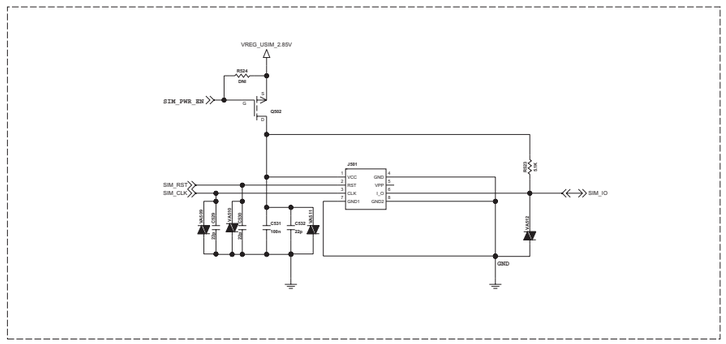


3.5pi Ear Jack Connector

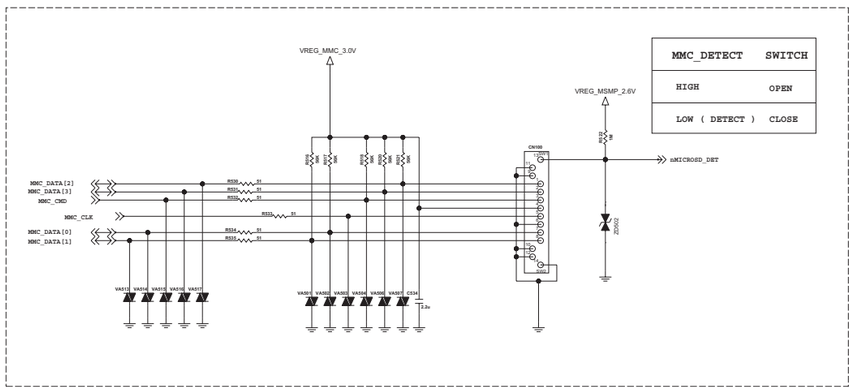


EAR_SENSE	STATE
LOW(DEFAULT)	UNMATING
HIGH	MATING

USIM



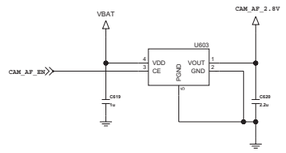
Micro SD



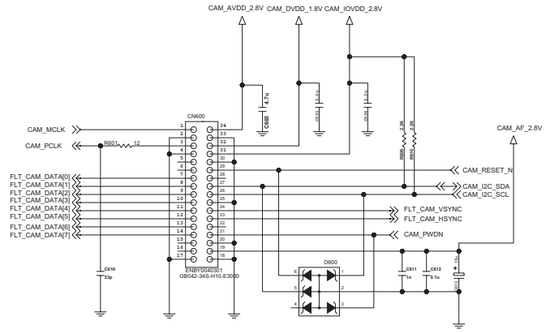
MMC_DETECT	SWITCH
HIGH	OPEN
LOW (DETECT)	CLOSE

5M CAMERA

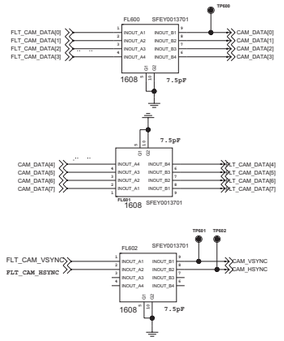
AF LDO



5M CAM CONNECTOR

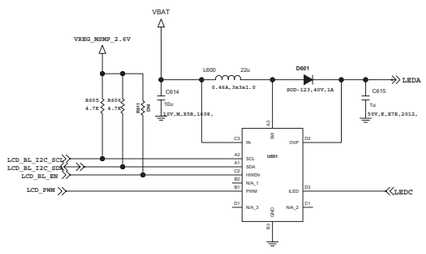


5M CAM EMI FILTER

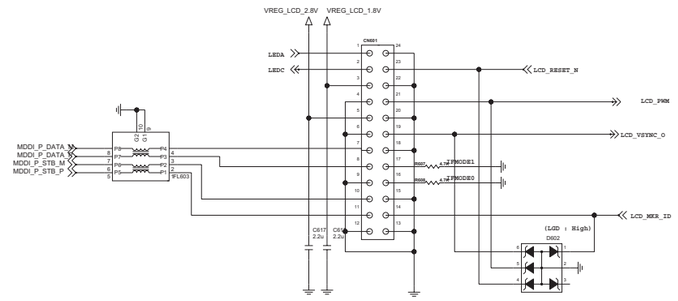


LCD

LCD BACKLIGHT LED BOOST

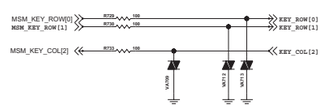


3.5" HVGA LCD Connector

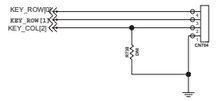


KEY

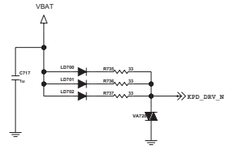
KEY PART



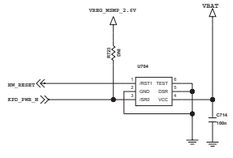
VOLUME SIDEKEY



KEY_BACKLINGT

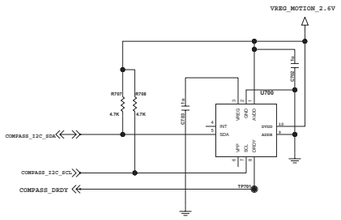


HW RESET IC

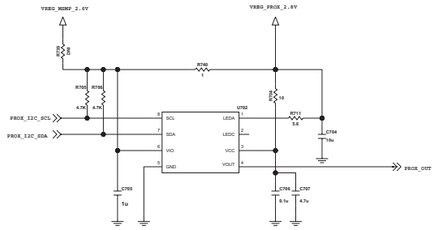


SENSORS

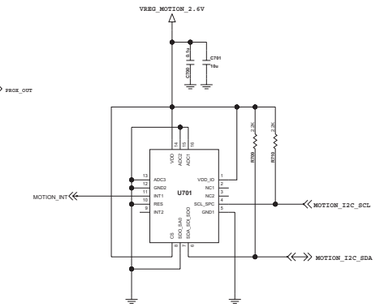
Digital Compass



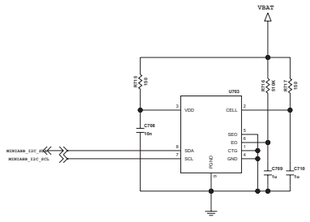
Proximity Sensor



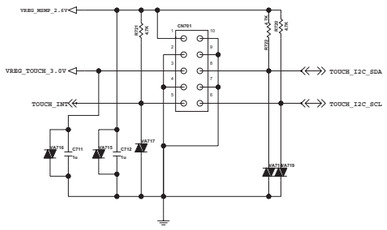
Acceleration Sensor



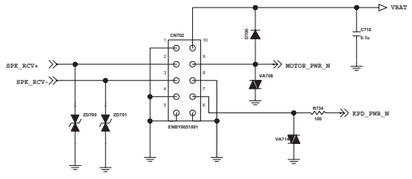
FUEL GAUGE



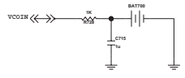
TOUCH



SUB PCB(MAIN TO SUB)

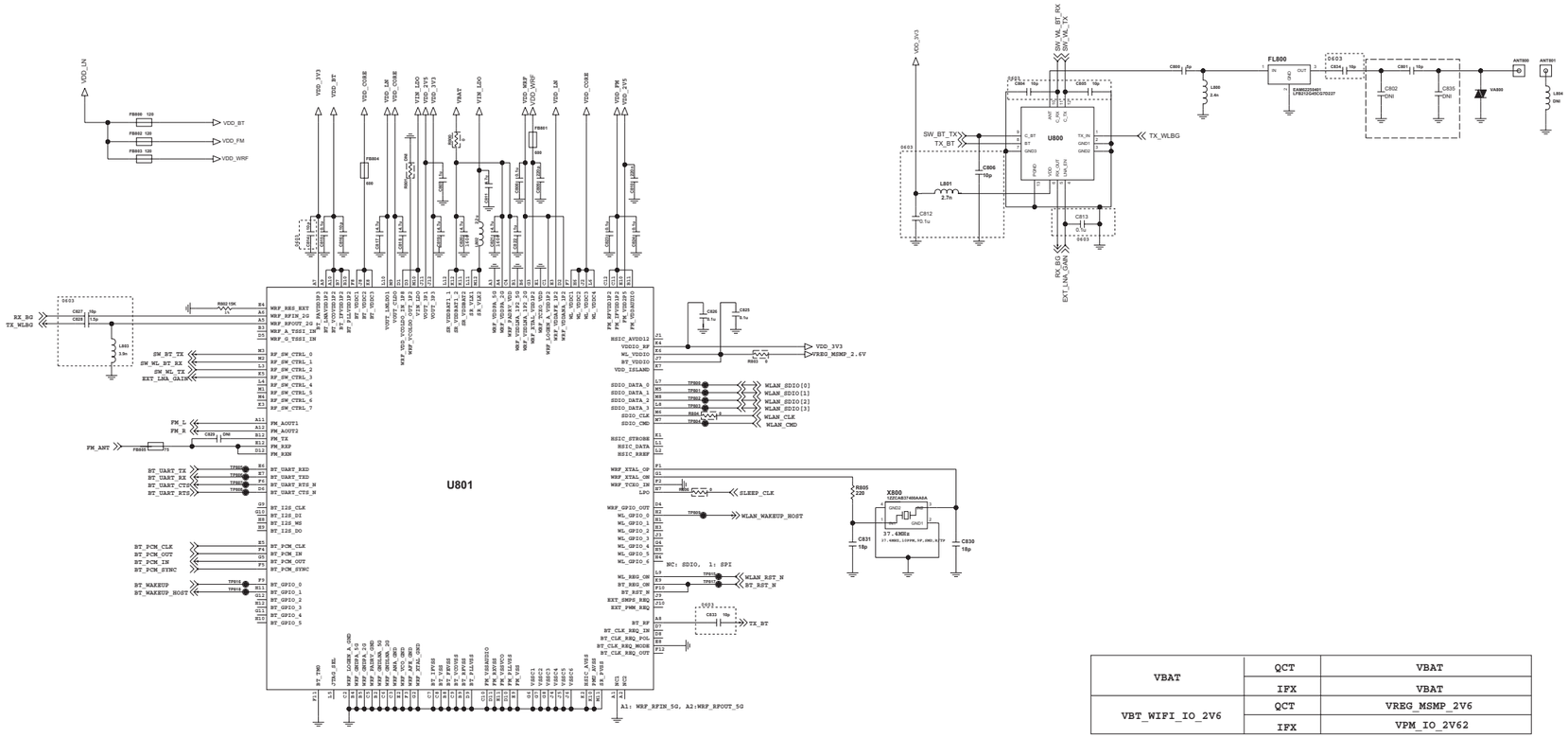


BACKUP BATT



BOSS Hole Gold

BCM4330_2.4GHz(QCT & IFX Only)

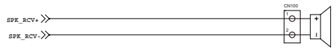


VBAT	QCT	VBAT
	IFX	VBAT
VBT_WIFI_IO_2V6	QCT	VREG_MSMP_2V6
	IFX	VPM_IO_2V62

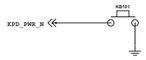
E510f_SUB_FPCB_1.0

VIBRATOR PAD

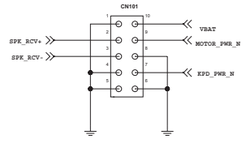
SPK & RCV PAD



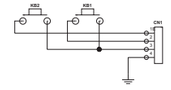
POWER KEY



FPCB TO MAIN CONN

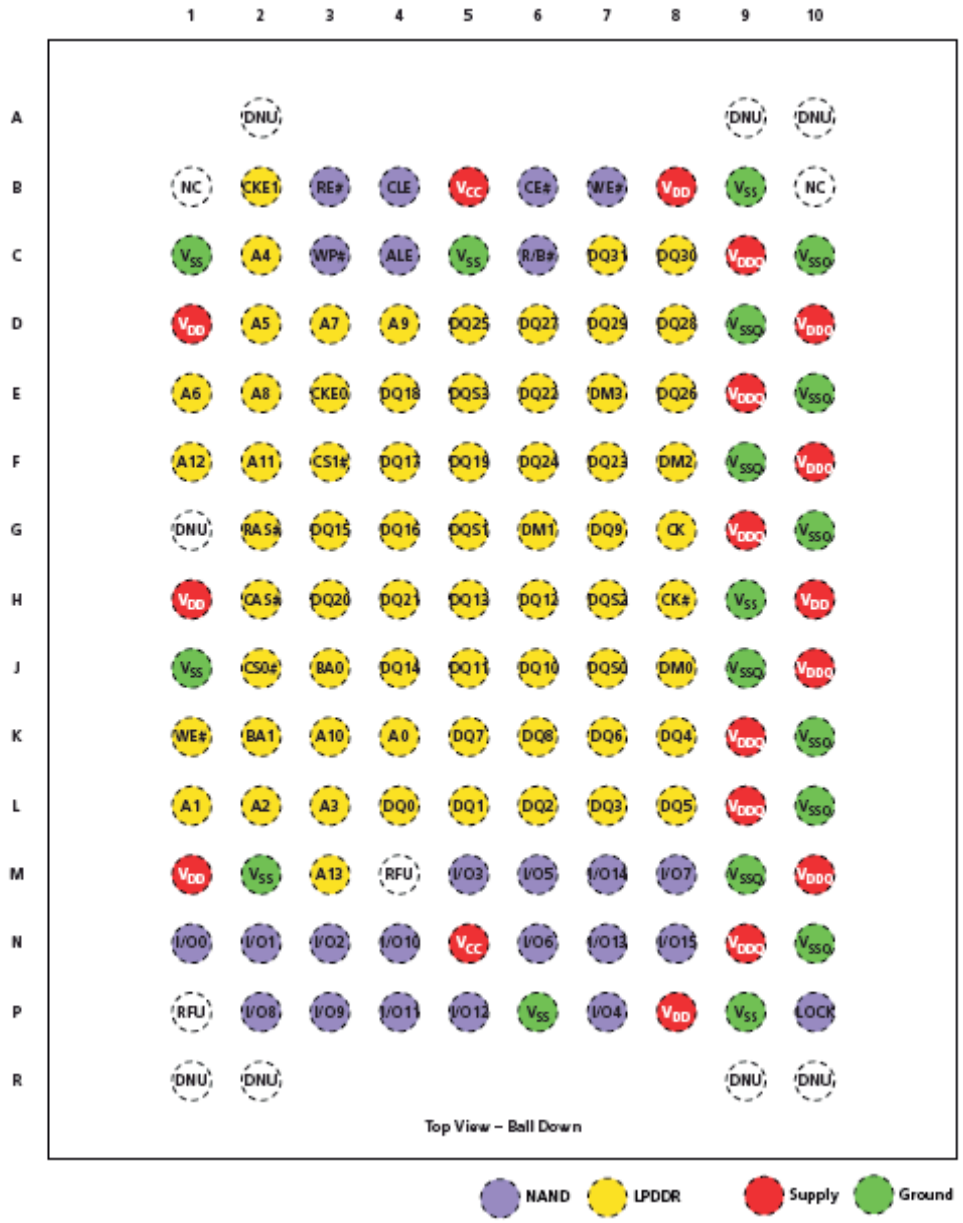


E510f_SK_VOL_REV.1.0

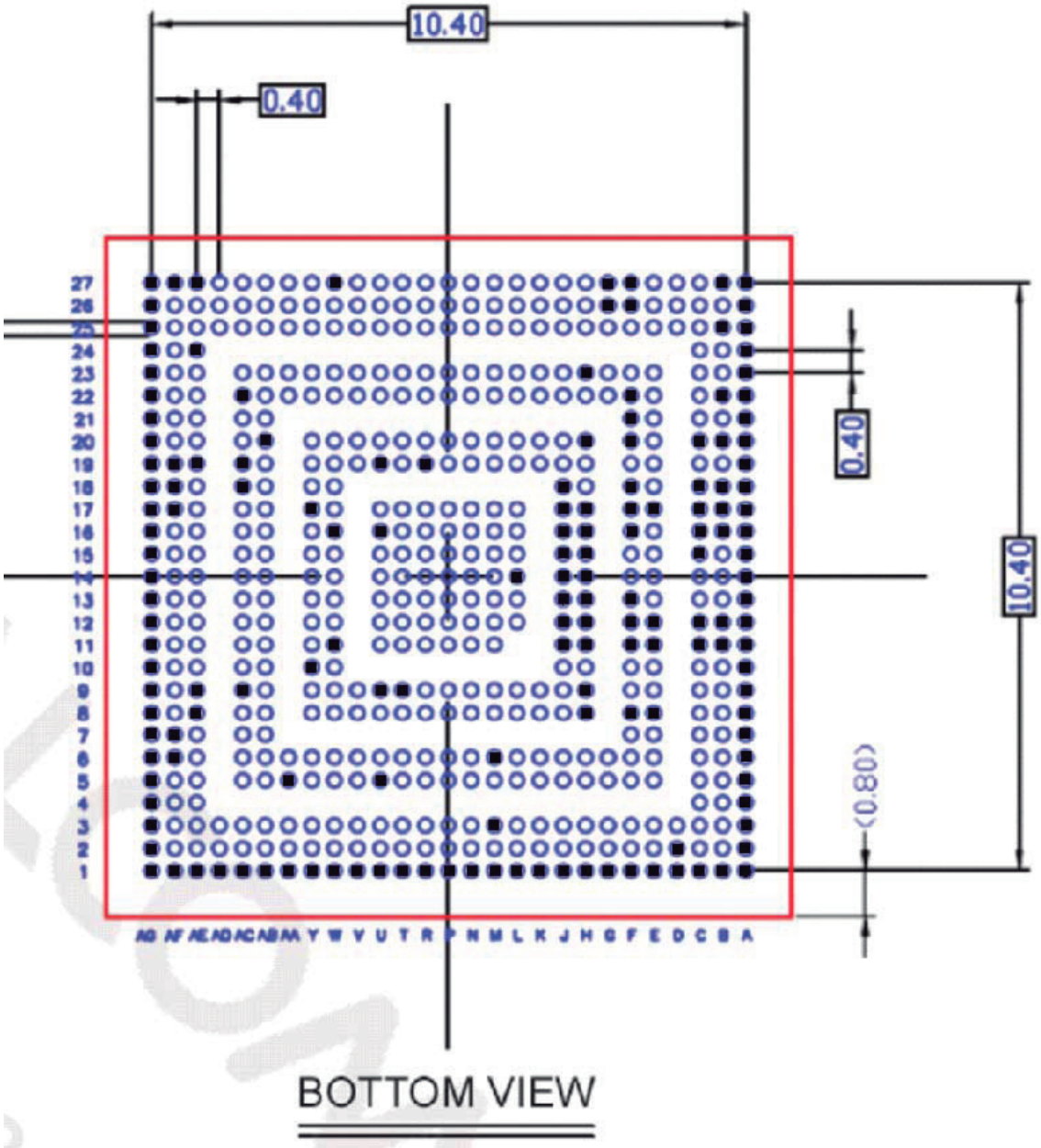


8. BGA PIN MAP

MCP



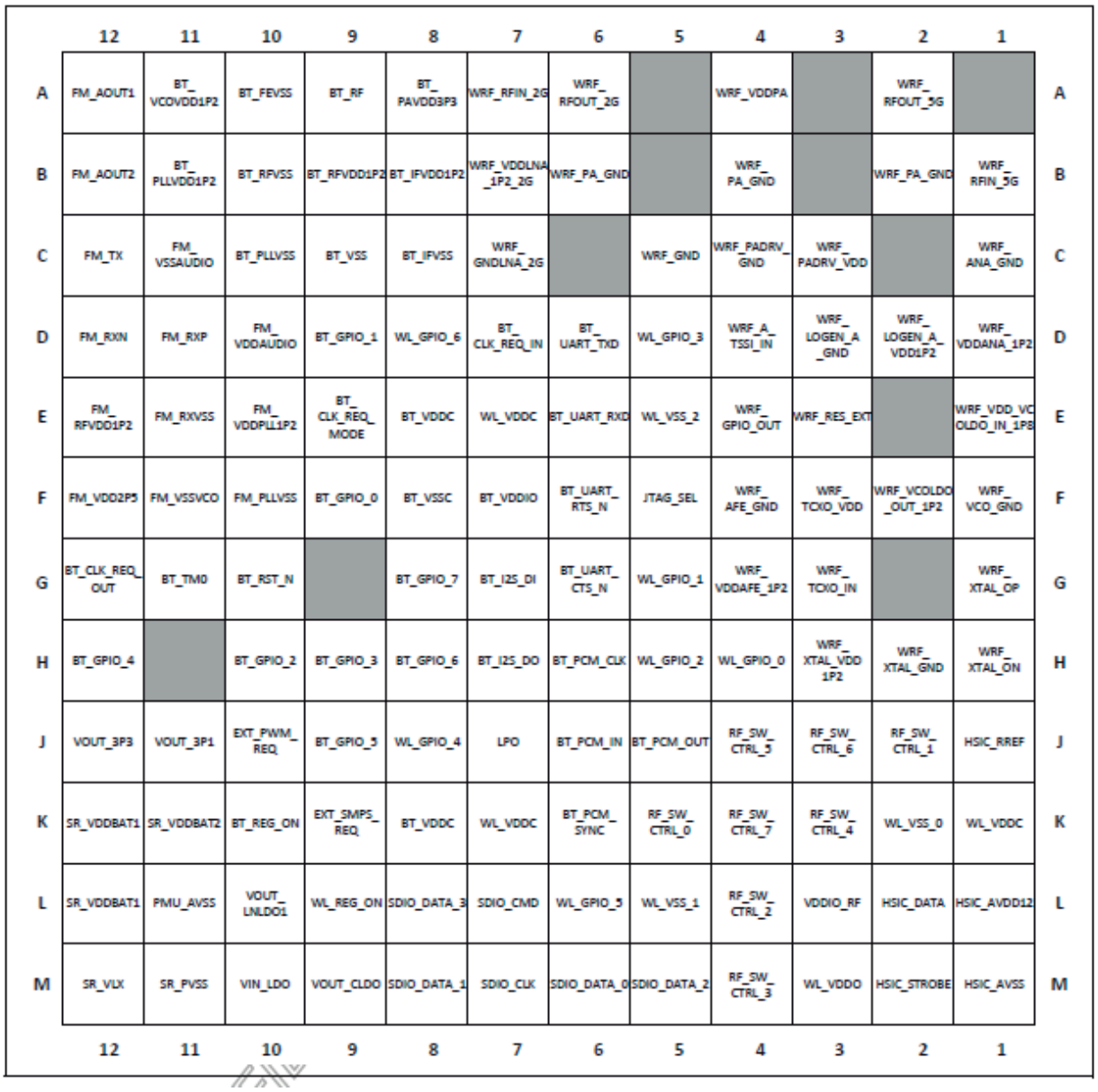
MSM7227T



○ USE

● NOT IN USE

BCM4330 (Botton View)

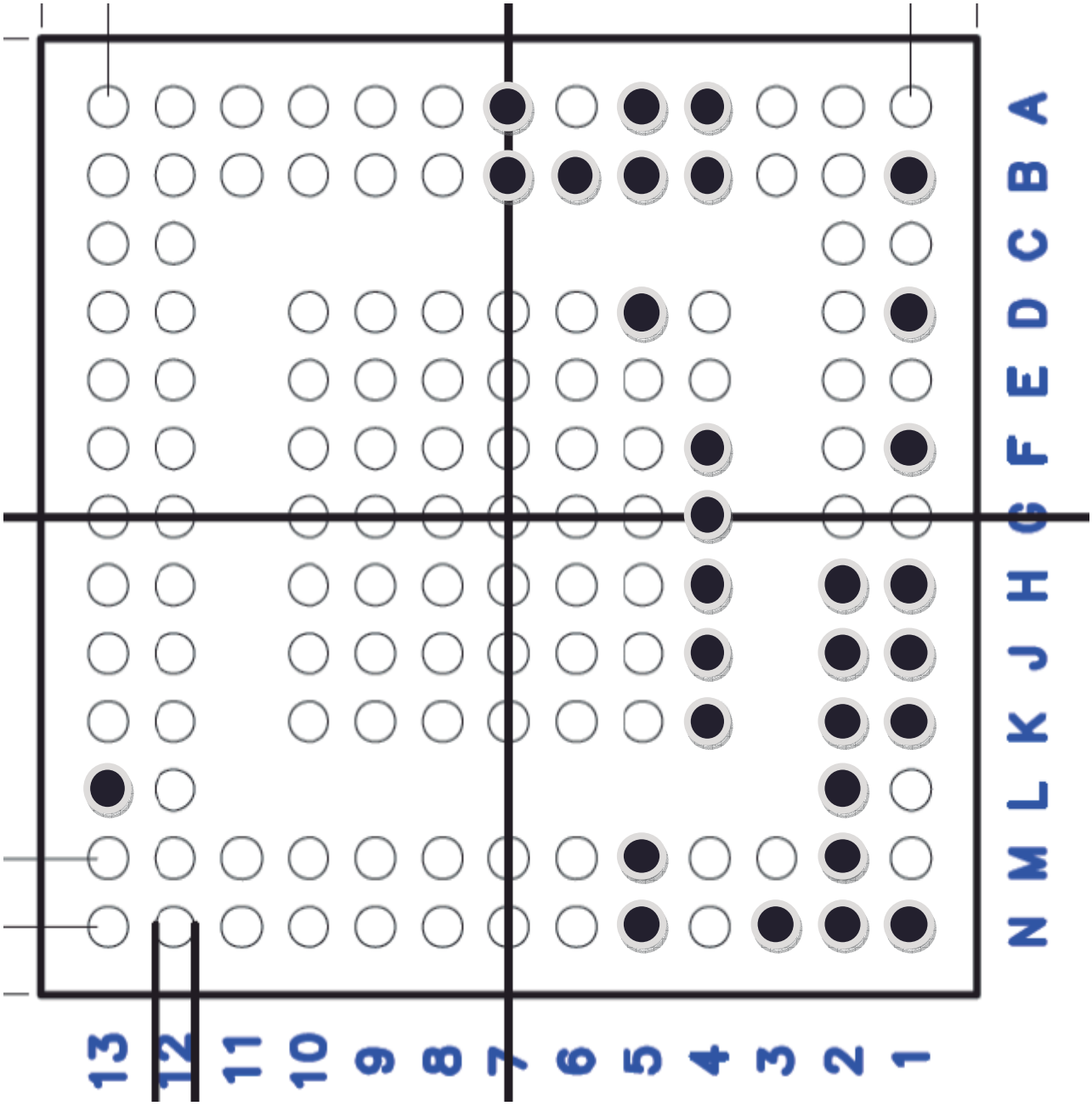


	12	11	10	9	8	7	6	5	4	3	2	1	
A	FM_AOUT1	BT_ VCOVDD1P2	BT_FEVSS	BT_RF	BT_ PAVDD3P3	WRF_RFIN_2G	WRF_ RFOUT_2G		WRF_VDDPA		WRF_ RFOUT_5G		A
B	FM_AOUT2	BT_ PLLVDD1P2	BT_RFVSS	BT_RFVDD1P2	BT_IFVDD1P2	WRF_VDDLNA _1P2_2G	WRF_PA_GND		WRF_ PA_GND		WRF_PA_GND	WRF_ RFIN_5G	B
C	FM_TX	FM_ VSSAUDIO	BT_PLLVSS	BT_VSS	BT_IFVSS	WRF_ GNDLNA_2G		WRF_GND	WRF_PADRV_ GND	WRF_ PADRV_VDD		WRF_ ANA_GND	C
D	FM_RXN	FM_RXP	FM_ VDDAUDIO	BT_GPIO_1	WL_GPIO_6	BT_ CLK_REQ_IN	BT_ UART_TXD	WL_GPIO_3	WRF_A_ TSSI_IN	WRF_ LOGEN_A _GND	WRF_ LOGEN_A_ VDD1P2	WRF_ VDDANA_1P2	D
E	FM_ RFVDD1P2	FM_RXVSS	FM_ VDDPLL1P2	BT_ CLK_REQ_ MODE	BT_VDDC	WL_VDDC	BT_UART_RXD	WL_VSS_2	WRF_ GPIO_OUT	WRF_RES_EXT		WRF_VDD_VC OLDO_IN_1P8	E
F	FM_VDD2P5	FM_VSSVCO	FM_PLLVSS	BT_GPIO_0	BT_VSSC	BT_VDDIO	BT_UART_ RTS_N	JTAG_SEL	WRF_ AFE_GND	WRF_ TCXO_VDD	WRF_VCOLDO _OUT_1P2	WRF_ VCO_GND	F
G	BT_CLK_REQ_ OUT	BT_TM0	BT_RST_N		BT_GPIO_7	BT_I2S_DI	BT_UART_ CTS_N	WL_GPIO_1	WRF_ VDDAFE_1P2	WRF_ TCXO_IN		WRF_ XTAL_OP	G
H	BT_GPIO_4		BT_GPIO_2	BT_GPIO_3	BT_GPIO_6	BT_I2S_DO	BT_PCM_CLK	WL_GPIO_2	WL_GPIO_0	WRF_ XTAL_VDD 1P2	WRF_ XTAL_GND	WRF_ XTAL_ON	H
J	VOUT_3P3	VOUT_3P1	EXT_PWM_ REQ	BT_GPIO_5	WL_GPIO_4	LPO	BT_PCM_IN	BT_PCM_OUT	RF_SW_ CTRL_5	RF_SW_ CTRL_6	RF_SW_ CTRL_1	HSIC_RREF	J
K	SR_VDDBAT1	SR_VDDBAT2	BT_REG_ON	EXT_SMPS_ REQ	BT_VDDC	WL_VDDC	BT_PCM_ SYNC	RF_SW_ CTRL_0	RF_SW_ CTRL_7	RF_SW_ CTRL_4	WL_VSS_0	WL_VDDC	K
L	SR_VDDBAT1	PMU_AVSS	VOUT_ LNLDO1	WL_REG_ON	SDIO_DATA_3	SDIO_CMD	WL_GPIO_5	WL_VSS_1	RF_SW_ CTRL_2	VDDIO_RF	HSIC_DATA	HSIC_AVDD12	L
M	SR_VLX	SR_PVSS	VIN_LDO	VOUT_CLDO	SDIO_DATA_1	SDIO_CLK	SDIO_DATA_0	SDIO_DATA_2	RF_SW_ CTRL_3	WL_VDDO	HSIC_STROBE	HSIC_AVSS	M
	12	11	10	9	8	7	6	5	4	3	2	1	

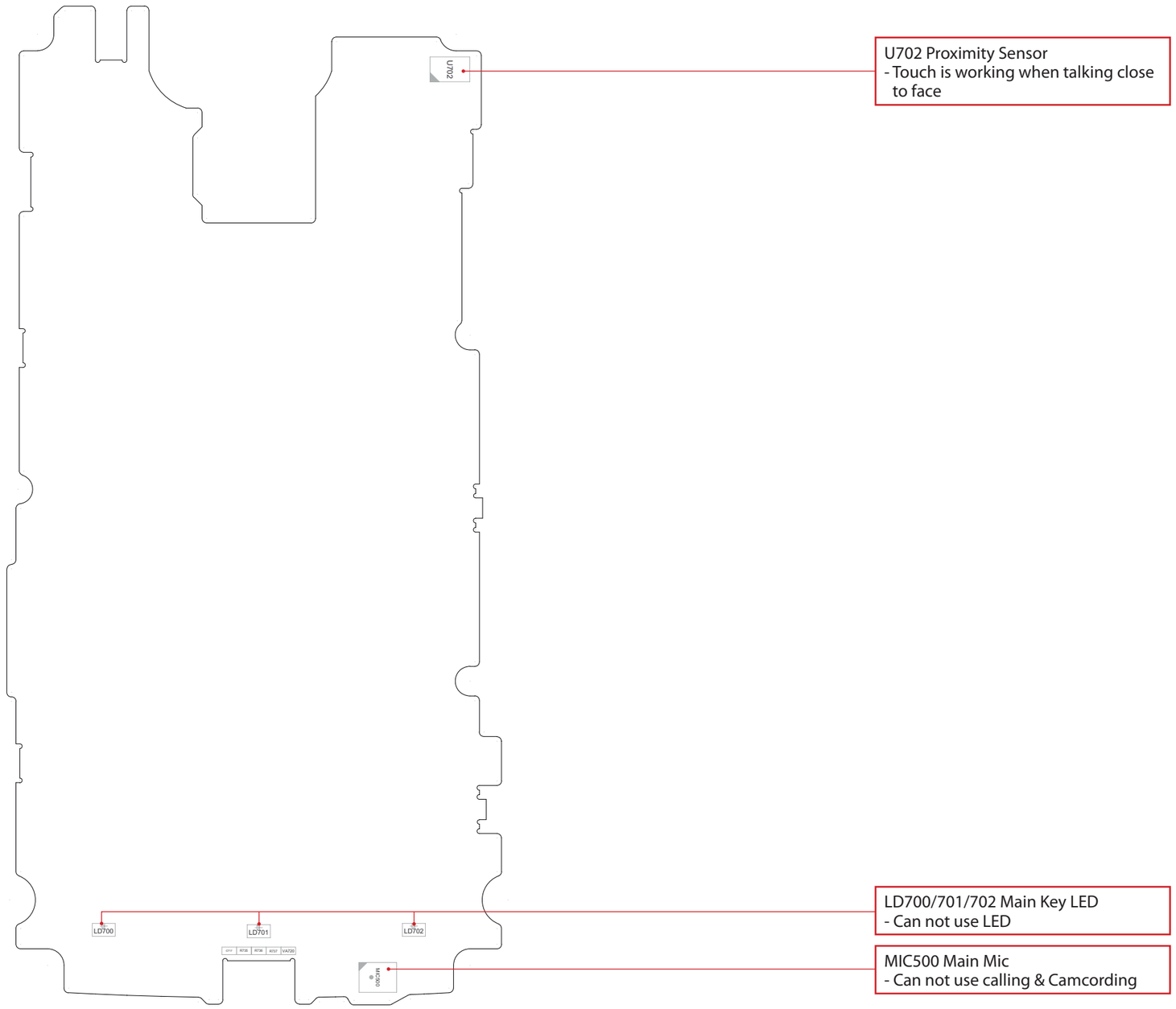
USE

NOT IN USE

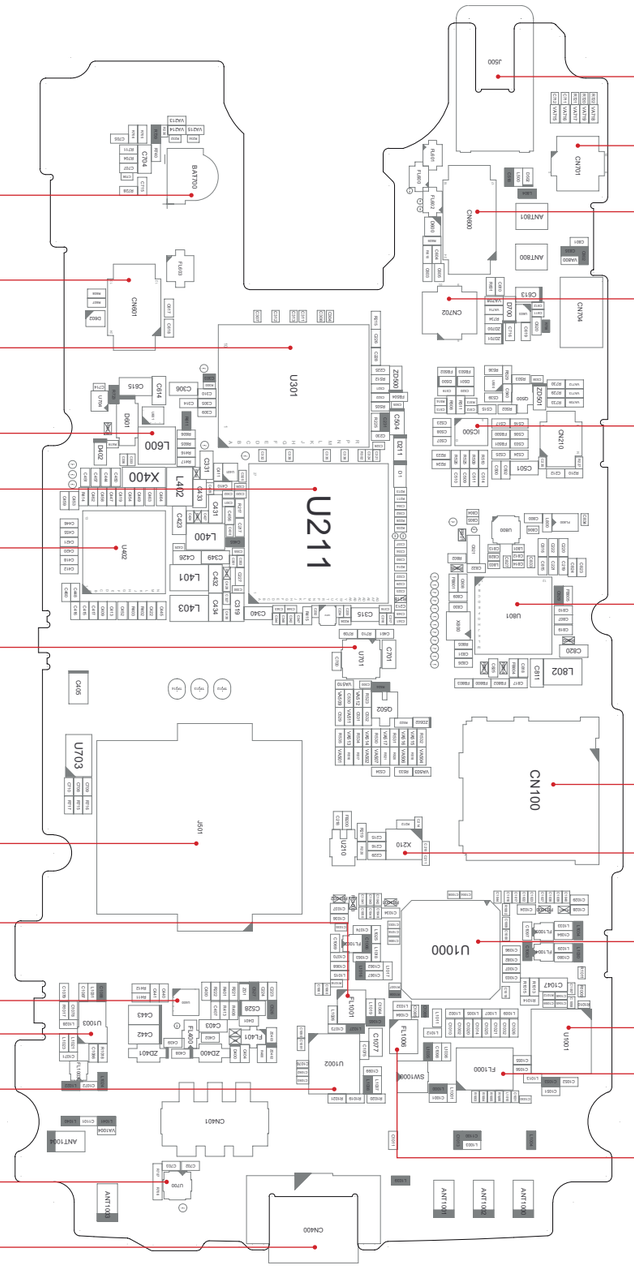
PM7540(PMIC)



9. PCB LAYOUT



LG-E510_MAIN_EAX64302701_1.0_TOP



BAT700 Back up Battery
- Can not use Clock when reset power

CN601 LCD Conn
- Can not use LCD

U301 Memory
- No booting, reset, ETC

L600 LCD Booster
- No Display

U211 Main Chipset
- No booting, reset, ETC

U402 PMIC
- No Power on, No Function, ETC

U701 Motion Sensor
- Can not use motion sensing Function

J501 USIM Conn
- No SIM

FL1001 Duplexer
- WCDMA 900 Rx no service

U400 MINIABB IC
- Can not use USB, No charging

U1003 GPS IC
- Can not use GPS Function

U1002 WCDMA PAM
- Tx power No service

U700 Compass Sensor
- Can not use Compass Function

CN400 Micro 5pin USB Conn
- Can not use USB, Charging

J500 3.5pi Ear-jack Conn
- Can not use Ear-jack

CN701 Touch Conn
- Can not use Touch

CN600 Camera Conn
- Can not use Camera

CN702 Sub Carrier Conn.
- Can not use Sound, motor, Power Key

IC500 Audio Sub System
- Can not use Sound,Headset

U801 Connectivity FEM
- Can not use BT, FM, Wifi

CN100 Micro SD Socket
- Can not use Micro SD Card

X210 TCXO
- No Power On

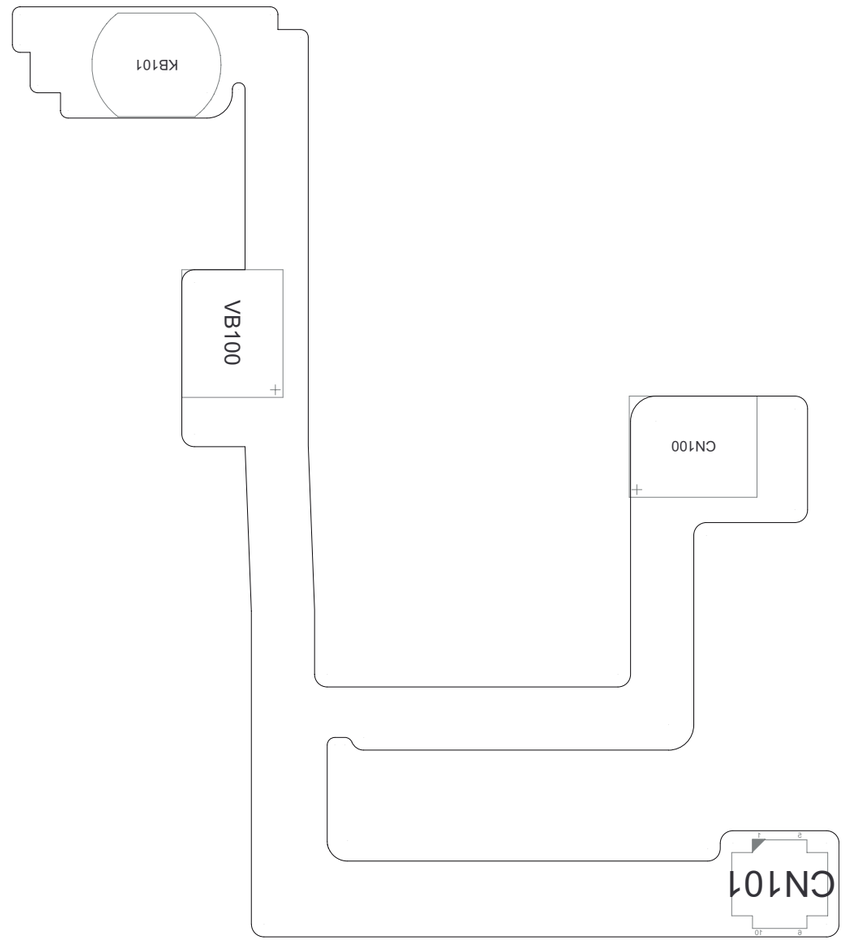
U1000 RF Transceiver
- No Network service

U1001 GSM PAM Tx power
- No service

FL1000 FEM
- WCDMA/GSM RX Sensitivity & TX Power No service

FL1006 Duplexer
- WCDMA 2100 T/Rx no service

LG-E510_MAIN_EAX64302701_1.0_BOT



LG-E510_F_SUB_EAX64305801_1.0_BOT

10. CALIBRATION

10.1 General Description

This document describes how to install and use the RF calibration software(Tachyon) of LG 3G mobile phone with Qualcomm Chipsets.

10.2 Requirement

Requirements for RF calibration of LGE mobile phone are outlined in the following sections.

10.2.1 Hardware

1) Desktop or laptop computer
2) Agilent 8960 Series 10 (E5515C) Testset
3) GPIB card and cable for communicating with Agilent 8960 Series 10 Testset
4) Power Supply, or 4V battery, and power cable for putting power on the mobile phone.
5) Data(USB or UART) cables for connecting the mobile phone to computer's serial port
6) RF cable

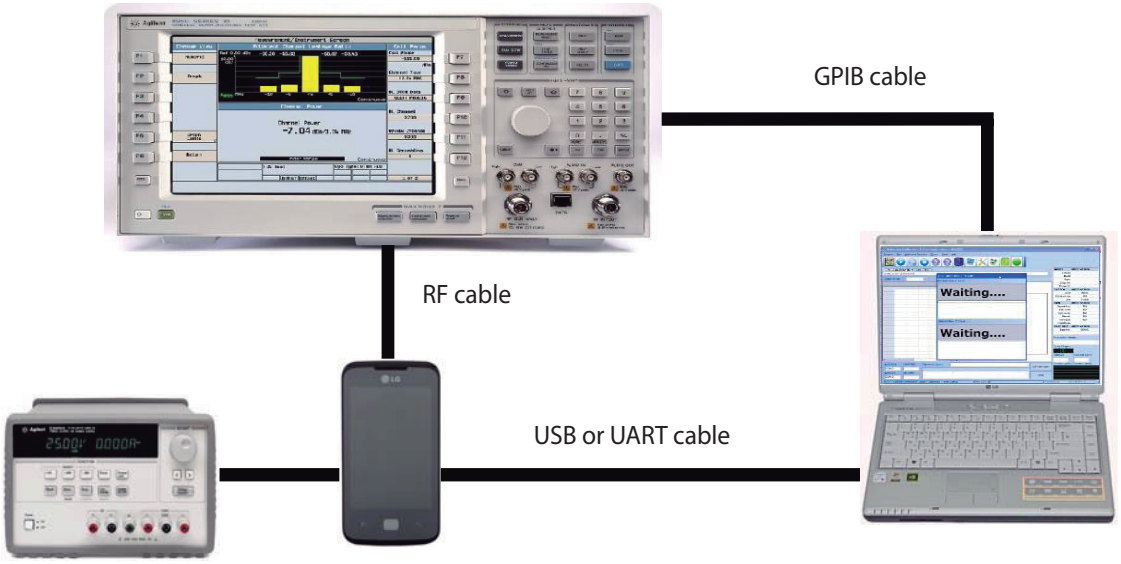
10.2.2 driver

1) National Instruments GPIB & VISA driver
2) LGE mobile USB driver
3) Data cable driver(optional)

10.2.3 System

1) Windows XP SP2 or better
2) RAM 512M or grater
3) HDD 1GB of available space

10.3 Setup for RF calibration



10.4 Tachyon Software Installation

1) Install Tachyon_setup_Eng_20090326 to C:/LGE/Tachyon directory.

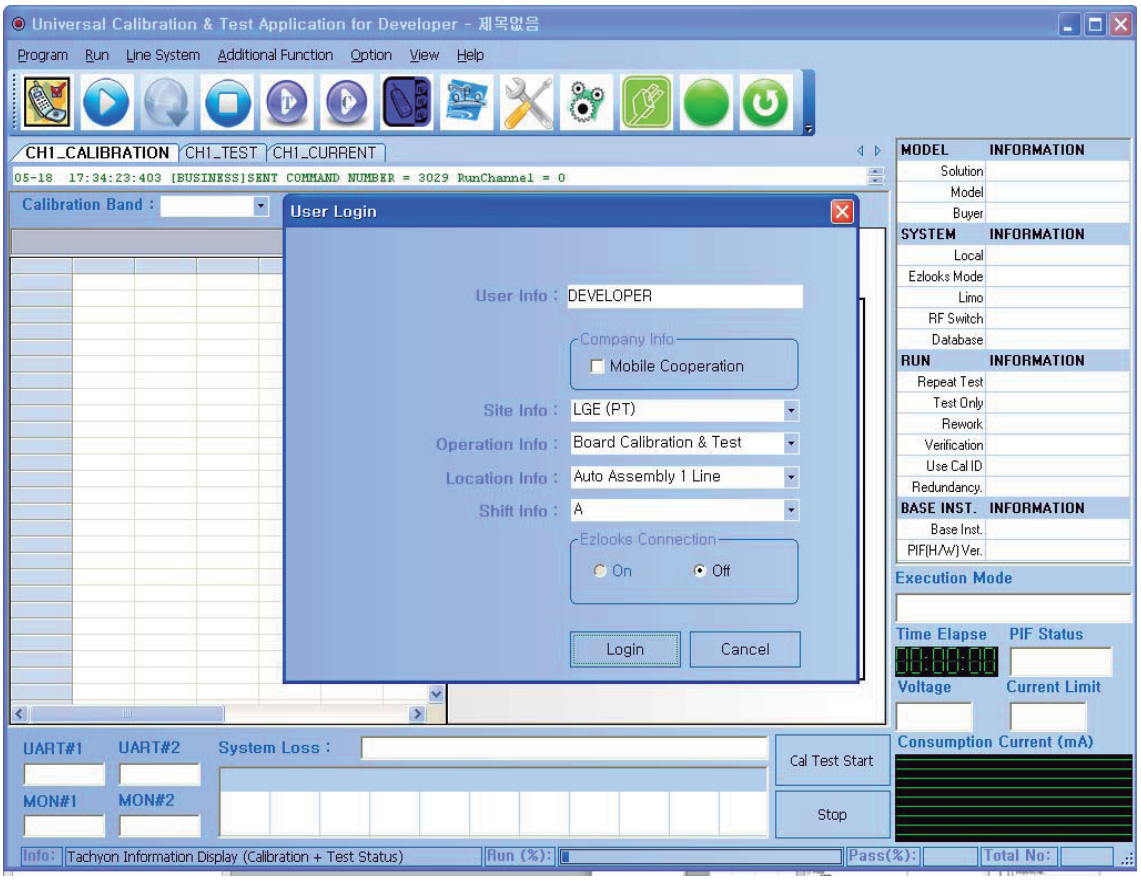
2) Unzip Tachyon_Release_20110331.zip, and overwrite all files to the same path.

3) Install OCX_Registration.bat in C:/LGE/Tachyon/OCX/ directory for registering Tachyon Components.

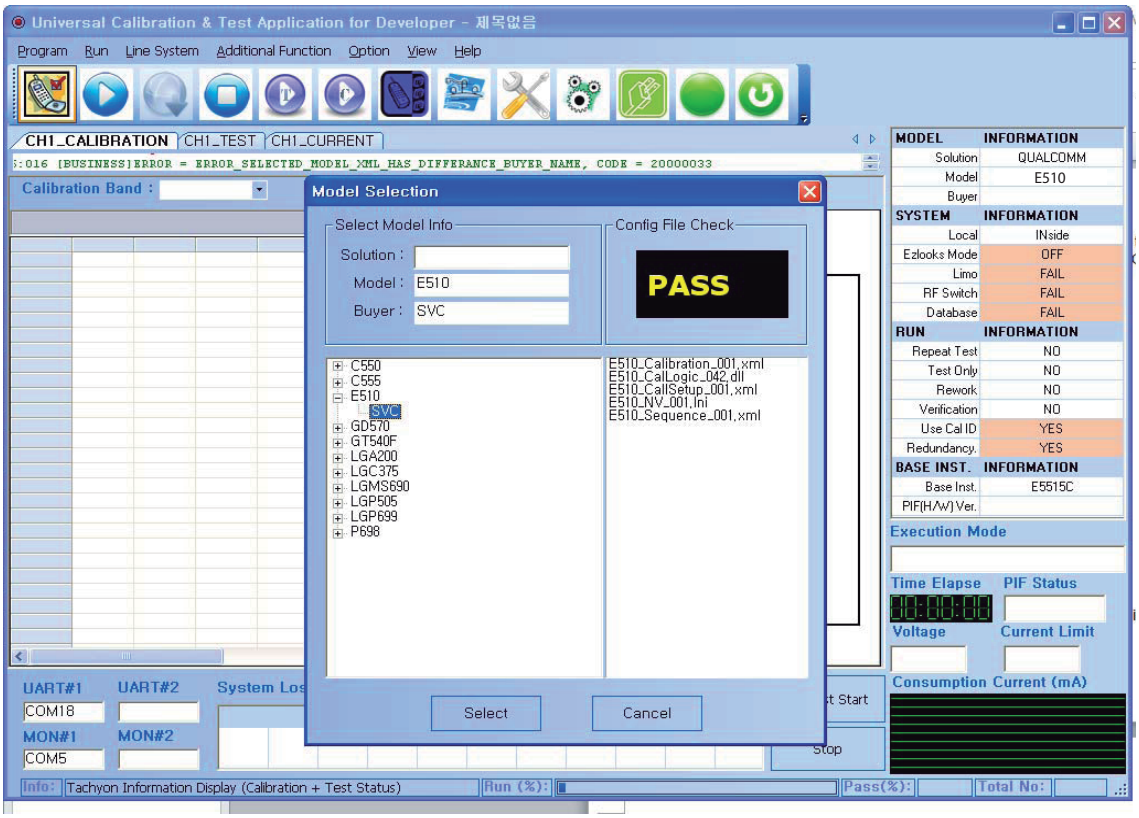
10.5 Tachyon Start

After hardware setup is completed successfully and Tachyon program is installed ordinarily,
RF calibration or Auto Test can be start in the following procedure.

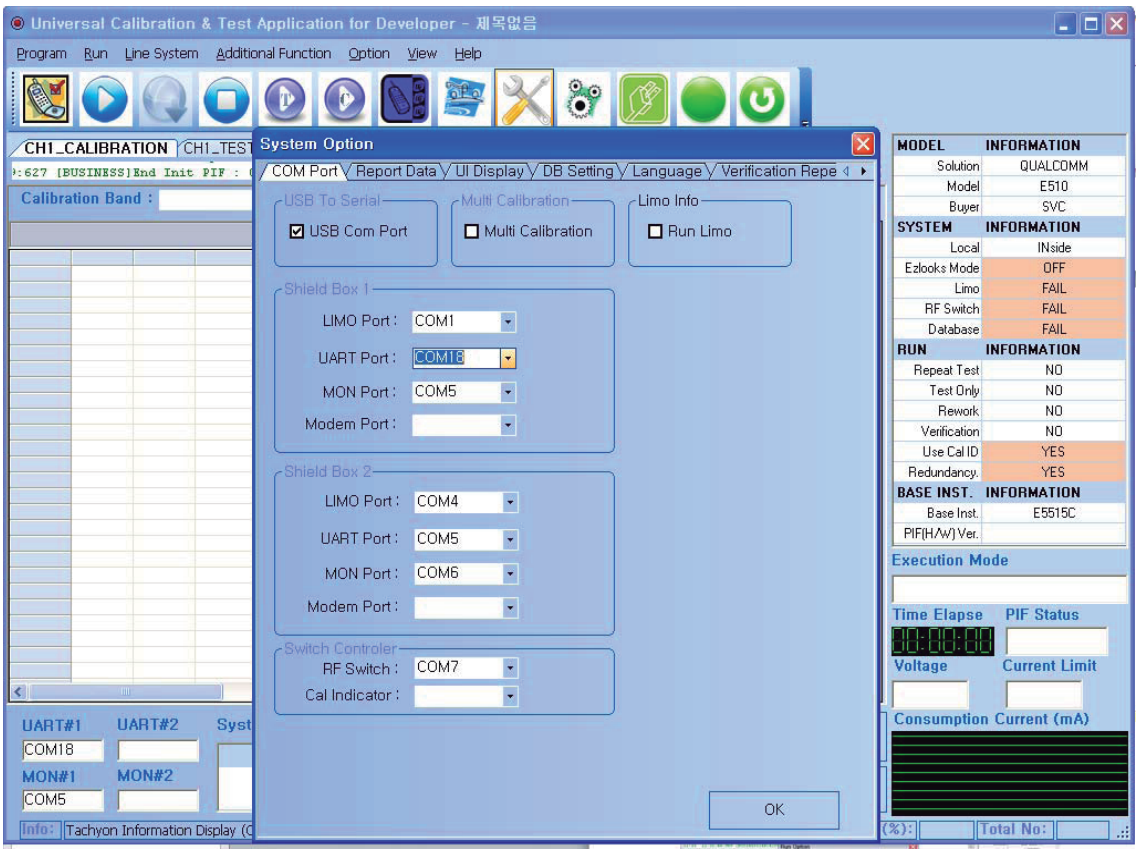
1) Execute Tachyon.exe in C:/LGE/Tachyon directory.
2) Click login button in the following login dialog window.



3)Click “model selection” button in toolbar for selecting the appropriate model.
4) double click E510/ORF in model tree, and then click ”select” button.

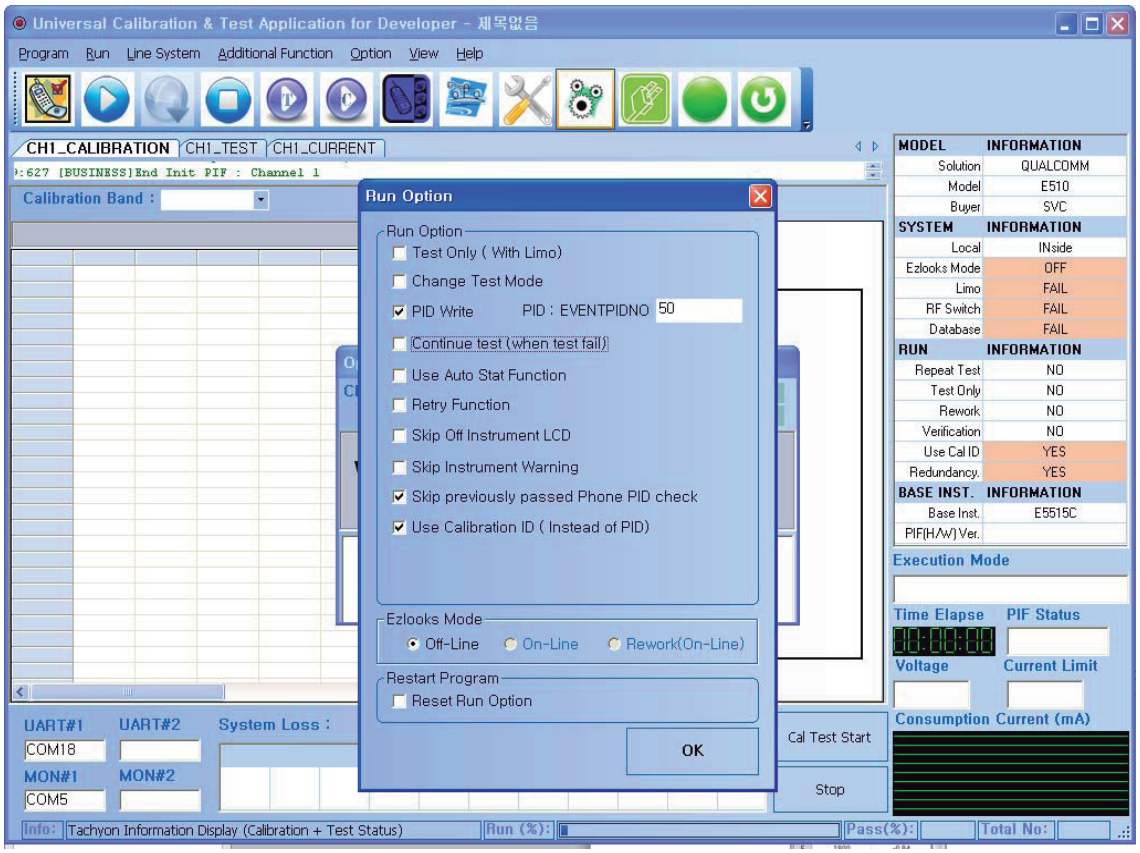


5) Click “system option” button in toolbar to connect the mobile phone to the Tachyon.
Choose the right UART and MON Port in shield Box 1 or 2, where MON port should be chosen only if PIF, USB to UART converter, is used to connect a phone.

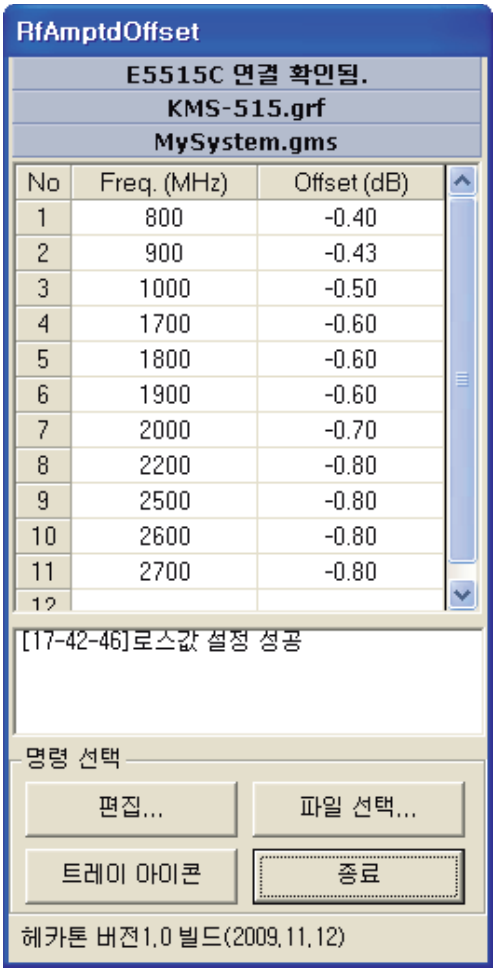


6) Click “run option” button in toolbar for passing over LGE factory setting.

7) Check “PID write” and “Skip previously Phone PID check” (PID is the number for LGE internal production)



8) Execute Hecaton.exe for setting RF cable loss to Agilent 8960. If not, Tachyon can't run.
In the First, There aren't any RF cable loss files in C:/LGE/Tachyon/Config. So two files for the RF antenna cable and M
cable loss should be created in this program.



9) Click "Calibration+Auto Test" button in Toolbar. Now RF calibration and autotest will start.
For more information, refer to the manual in C:/LGE/Tachyon/Manual folder.

10.6 Overview of RF Calibration

10.6.1 Supported entry of RF Calibration

Most of the calibration for E510 follows the recommendations of the Qualcomm. Table 1-1 and Table 1-2 describe the information of RF calibration items for E510. For more information, please refer to RF NV item documents for RTR6285.

Table 1-1. The calibration list for WCDMA

Calibration	WCDMA 2100	WCDMA 900	description
Tx Sweep Calibration	○	○	Tx output power measurements
Tx Hdet Calibration	○	○	HDET ADC vs Tx power measurement
Tx Comp vs Freq Calibration	○	○	Tx channel compensation
Tx Secondary Comp vs Freq Calibration	X	X	Specific only for RTR6285
Tx Lim vs Freq Calibration	○	○	Tx target power compensation
Rx DVGA Gain Offset Calibration	○	○	Rx DVGA gain measurements
Rx DVGA Gain Offset vs Freq Calibration	○	○	RX DVGA gain channel compensation
Rx LNA Range Offset Calibration	○	○	LNA gain measurement
Rx LNA Range Offset vs Freq Calibration	○	○	LNA gain channel compensation

Table 1-2. The calibration list for GSM

Calibration	GSM900	GSM850	GSM1800	GSM1900	description
VCO Calibration	○	X	X	X	VCO PDM measurement
Thermistor Calibration	X	X	X	X	Thermistor max/min ADC measurement
Tx External Polar Calibration	○	○	○	○	Tx output power measurement
Polar path delay Calibration	X	X	X	X	Tx PM and AM signal path delay compensation
Carrier Suppression Calibration	X	X	X	X	carrier power measurement
Rx Gain Range Calibration	○	○	○	○	Rx Gain measurement

10.6.2 Feature of RF calibration

This section describes the information used in calibration items in more detail.

WCDMA band

Table 1-3 describes the calibration feature of WCDMA band.

Table 1-3. Feature of Tx/Rx calibration in WCDMA 2100/900 band

Item		Sub Item	WCDMA 2100	WCDMA 900
Calibration Channel		Tx	9883	2712
		Rx	10833	3088
Tx Target Power(dBm)			22.5	22.5
PAM gain switching(dBm)		High to low gain	11.0	11.0
		Low to high gain	14.0	14.0
High Gain Mode	Calibrated PDM Range	Max	214	201
		Min	162	106
	PDM step		2	3
	Measured data of 32 array		26	25
	Threshold of Power Range(dBm)	≥ Up threshold	25.0	25.0
		≤ Low threshold	6.0	6.0
Low Gain Mode	Calibrated PDM Range	Max	210	255
		Min	75	69
	PDM step		5	6
	Measured data of 32 array		27	26
	Threshold of Power Range(dBm)	≥ Up threshold	17.0	16.0
		≤ Low threshold	-55.0	-55.0
Allowable power range in HDET range(dBm)		≥ Lower limit	16.5	16.5
		≤ Upper limit	24.5	24.5
Allowable HDET adc range		≥ Lower limit	30	35
		≤ Upper limit	190	220
DVGA Calibration Power(dBm)			-74.0	-74.0
DVGA Calibration Range		≥ Lower limit	130	50
		≤ Upper limit	300	300
LNA Calibration Power(dBm)		Range 0-1	-66.0	-68.0
		Range 1-2	-42.0	-50.0
		Range 2-3	-26.0	-38.0
		Range 3-4	X	-26.0

Quad GSM band

Table 1-4 describes the calibration feature of Quad GSM bands.

Table 1-4. Feature of Tx/Rx calibration in Quad GSM band

Item	Sub item	GSM 900	GSM 850	GSM 1800	GSM 1900
Tx Calibration channel	F1	975	128	512	512
	F2	124	251	885	810
Power range in AMAM/AMPM NVs (dBm)	Max	34.0	34.0	31.0	31.0
	Min	-20.0	-20.0	-20.0	-20.0
Rx Gain Range Calibration Power (dBm)	Range 0	-80	-80	-80	-80
	Range 1	-80	-80	-80	-80
	Range 2	-50	-50	-50	-50
	Range 3	-50	-50	-50	-50
	Range 4	-50	-50	-50	-50
Rx Gain Range Calibration Range (Lower limit/Upper limit)	Range 0	1900/2500	1900/2500	1900/2500	1900/2500
	Range 1	1200/2300	1200/2300	1200/2300	1200/2300
	Range 2	1300/1900	1300/1900	1300/1900	1300/1900
	Range 3	1200/1800	1200/1800	1200/1800	1200/1800
	Range 4	1100/1700	1100/1700	1100/1700	1100/1700
Tx External Polar calibration PDM table	13025,1900,1950,2000,2050,2100,2150,2200,2250,2300,2350,2400,2450,2500,2550,2600,2650,2700,2750,2800,2850,2900,2950,3000,3075,3150,3225,3300,3375,3450,3525,3600,3675,3750,3825,3900,3975,4050,4125,4200,4275,4350,4425,4500,4575,4650,4725,4800,4875,4950,5025,5100,5175,5250,5325,5400,5475,5550,5625,5700,5775,5850,5925,6025,6125,6225,6325,6425,6525,6625,6725,6825,6925,7025,7125,7225,7325,7425,7525,7625,7725,7825,7925,8025,8125,8225,8325,8425,8525,8625,8725,8825,8925,9025,9125,9225,9325,9425,9525,9625,9725,9825,9925,10025,10125,10225,10325,10425,10525,10625,10725,10825,10925,11025,11125,11225,11375,11525,11675,11825,11975,12125,12275,12425,12575,12725,12875,13025,13175,13325,13475,13625,13775,13925,14075,14225,14375,14525,14675,14825,14975,15125,15275,15425,15575,15725,15875,16025,16175,16300				

Channels of RF Calibration

Table 1-5 WCDMA Channel

W2100 Tx	9621	9638	9656	9673	9691	9708	9726	9743	9761	9778	9796	9813	9831	9848	9866	9883
W2100 Rx	10571	10588	10606	10623	10641	10658	10676	10693	10711	10728	10746	10763	10781	10798	10816	10833
W900 Tx	2712	2722	2733	2743	2754	2765	2776	2787	2796	2806	2815	2825	2834	2844	2853	2863
W900 Rx	2937	2947	2957	2967	2977	2987	2997	3007	3017	3027	3037	3047	3057	3067	3077	3088

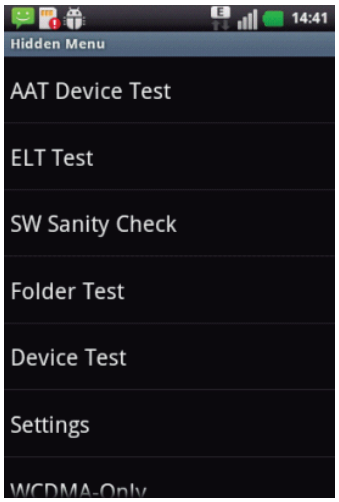
Table 1-5 GSM850/GSM900 Channel

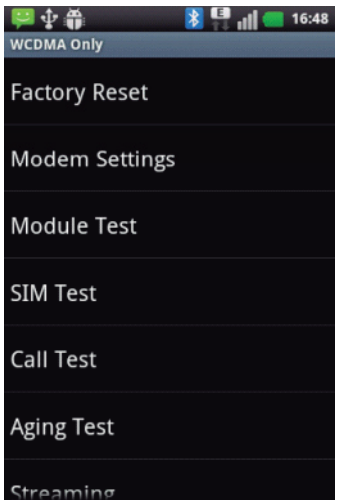
GSM850	12 8	14 5	16 3	180	19 8	215	23 3	251
GSM900	1	31	62	92	12 4	97 5	10 00	10 23

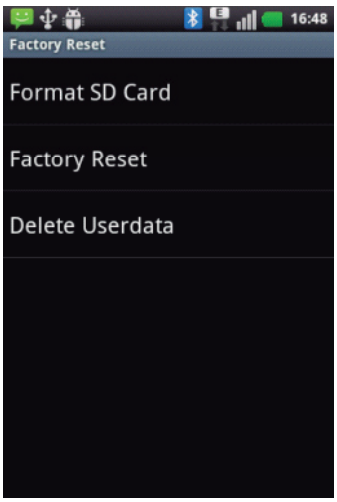
Table 1-7 GSM1800/GSM1900 Channel

GSM1800	512	537	562	587	612	637	662	687	712	737	762	787	812	837	862	885
GSM1900	512	532	552	572	592	612	632	652	672	692	712	732	752	772	792	810

11. HIDDEN MENU

	**Hidden Menu Start** Start shortcut keys: 3845#*510#
	**Hidden Menu** Start the desired menu: Menu, click
	**Version Info** Classified Information representation -> Hidden Menu -> Settings -> Version Info





Factory Reset

Format SD Card : SD Card Data reset

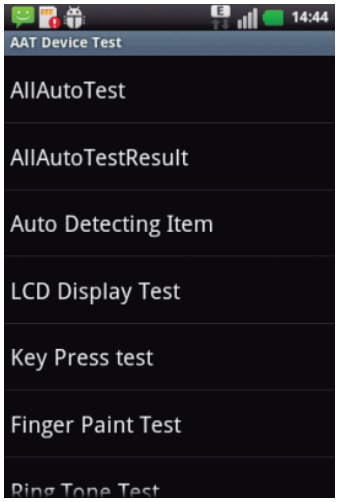
Factory Reset : Reset as default Factory Settings

Delete Userdata : Disabled

-> Hidden menu

-> WCDMA-Only

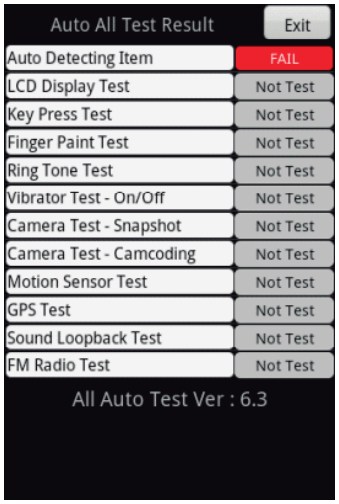
-> Factory Reset



AAT Device Test

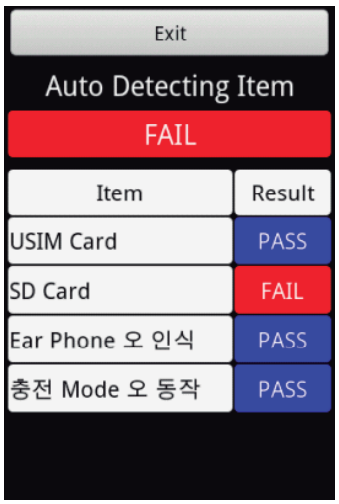
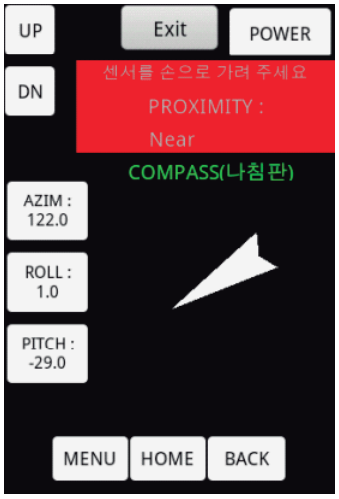
Allauto Test :

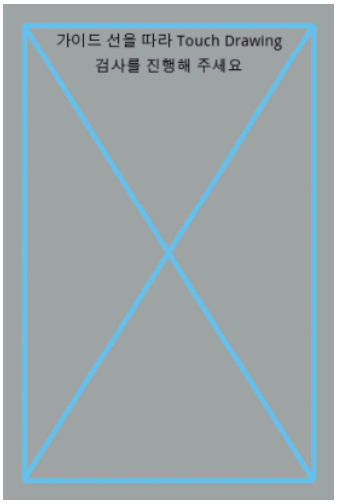
-> You can test all functions automatically

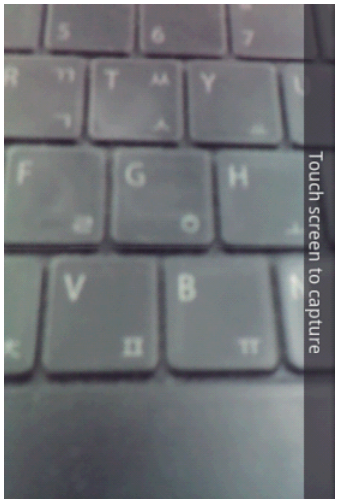
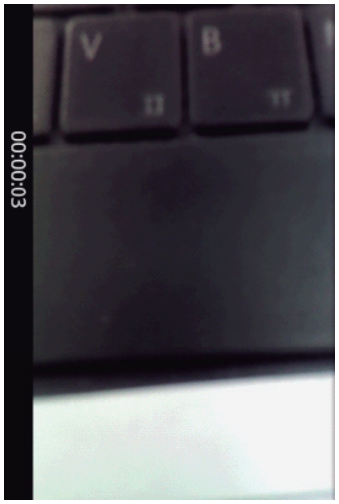


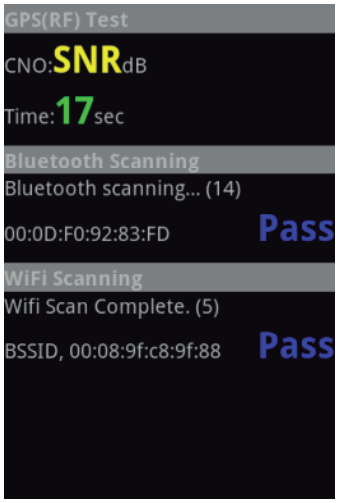
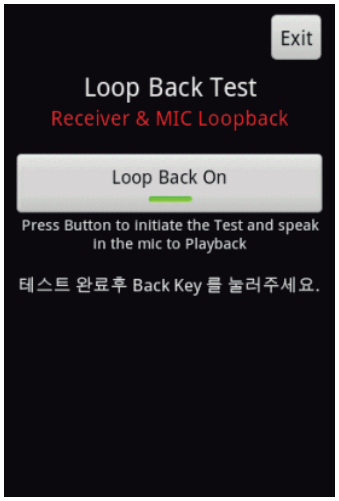
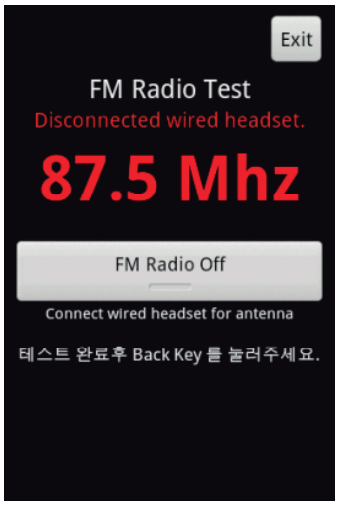
Auto All Test Result

-> You can check Test Results

	**Auto Detecting Item** Check below Items -> USIM Card : connecting is PASS -> SD Card : connecting is PASS -> Ear Phone : No connecting is PASS -> Charging Mode : No connecting is PASS
	**LCD Display Test** Check Black & White Color
	**Key Press Test** Check below Items Up/Down key : Hard Key Power key : Hard Key Menu key : Touch Key Home key : Touch Key Back key : Touch Key Compass Sensor : Check North Proximity Sensor : Bilnd the Proximity sensor

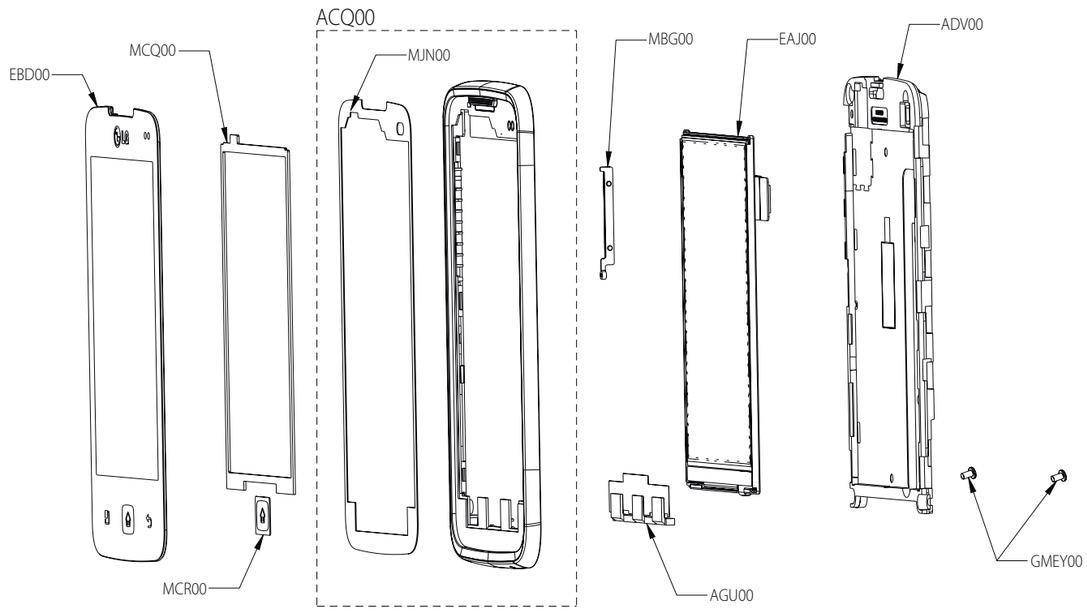
	**Finger Paint Test** Draw a guide line
	**Ring Tone Test** Touch the "Play" icon
	**Vibrator Test** Touch the "Start" icon

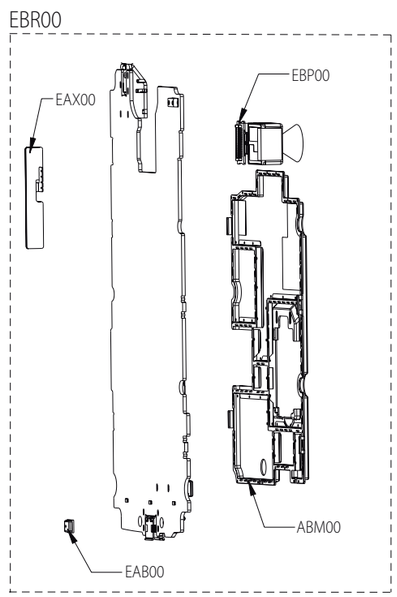
	**Camera Test – Snapshot** Touch screen to capture
	**Camera Test - Camcoding** Camera is recoding for 5 seconds
	**Motion Sensor Test** Check 3 positions -> Position horizontally -> Position Vertically -> Position side

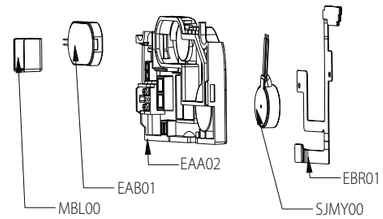
	**GPS BT Wifi Test** GPS(RF) test : CNO is some value : OK Bluetooth Scanning is PASS : OK WiFi Scanning is PASS : OK
	**Sound Loopback Test** "Look Back On" is test mode on "Look Back OFF" is test mode off
	**FM Radio Test** 87.5 Mhz is scanned automatically Connect ear-jack -> Touch "FM Radio Off" icon

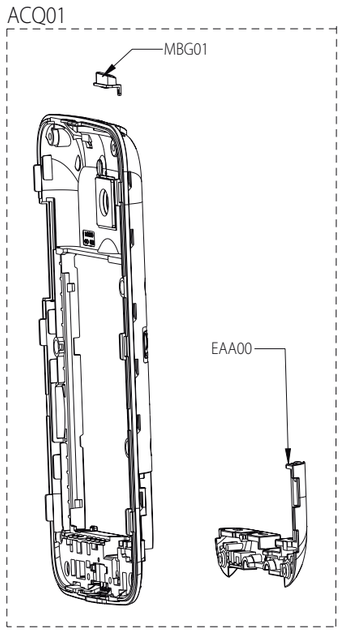
12. EXPLODED VIEW & REPLACEMENT PART LIST

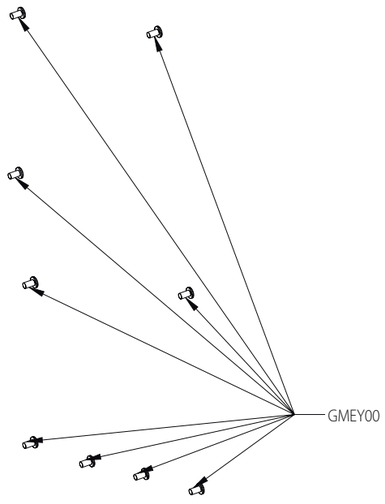
12.1 EXPLODED VIEW

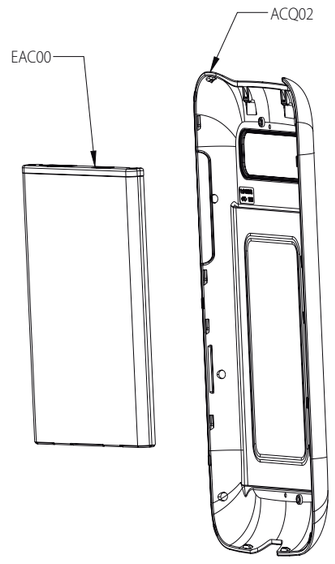












Location	Description
ACQ01	Cover Assembly,Rear
MBG01	Button
EAA00	PIFA Antenna,RF
MCQ00	Damper,LCD
MCR00	Decor
MBG00	Button,Side
GMEY00	Screw,Machine
AGU00	Plate Assembly
ADV00	Frame Assembly
ACQ00	Cover Assembly,Front
MJN00	Tape,Window
EBD00	Touch Window Assembly
EAJ00	LCD,Module-TFT
EAA02	PIFA Antenna,GPS
EBR01	PCB Assembly,Flexible
MBL00	Cap
EAB01	Speaker,Dual Mode
SJMY00	Motor,DC
GMEY00	Screw,Machine
EBR00	PCB Assembly,Main
EAX00	PCB,Sidekey
EBP00	Camera Module
ABM00	Can Assembly,Shield
EAB00	Microphone,Condenser
ACQ02	Cover Assembly,Battery
EAC00	Rechargeable Battery,Lithium Ion

12.2 Replacement Parts <Mechanic component>

Note: This Chapter is used for reference, Part order is ordered by SBOM standard on GCSC

Level	Location No.	Description	PartNumber	Spec	Remark
3	ACQ01	Cover Assembly, Rear	ACQ85833501	LGE510.ADEUBK ZZ:Without Color -	
4	MBG01	Button	MBG64365201	MOLD TPU LGE510F.ABRABK SY:Silver Gray -	
4	EAA00	PIFA Antenna, RF	EAA62666901	HIL-02B46-0000AA MULTI -2DB 3.0 LDS Type - E.M.W CO., LTD.	
4	MCQ00	Damper, LCD	MCQ66709301	COMPLEX LGSU570.ASKTBK BK:Black -	
4	MCR00	Decor	MCR64571001	CUTTING PC SHEET LGE510F.ABRABK ZZ:Without Color -	
4	MBG00	Button, Side	MBG64365101	MOLD TPU LGE510F.ABRABK SY:Silver Gray -	
4	GMEY00	Screw, Machine	GMEY0009201	GMEY0009201 BH + 2.7mM 3.5mM MSWR3 FZB N N LG ELECTRONICS INC.	
4	AGU00	Plate Assembly	AGU73788101	LGE510F.ABRABK ZZ:Without Color -	
4	ADV00	Frame Assembly	ADV74068301	LGE510F.ABRABK ZZ:Without Color LG-E510 FRAME ASS'Y	
4	ACQ00	Cover Assembly, Front	ACQ85607601	LGE510F.ABRABK ZZ:Without Color LG-E510 COVER FRONT ASS'Y	
5	MJN00	Tape, Window	MJN67896401	CUTTING TAPE LGE510F.ABRABK ZZ:Without Color LG-E510_Tape_Touch_Window1	
4	EBD00	Touch Window Assembly	EBD61185202	TSMC-G320B CAPACITIVE TOUCH GFF mXT140 3.5inch B to B - LG INNOTEK., LTD.	
4	EAJ00	LCD, Module-TFT	EAJ61770501	LH350H05-SD01 HVGA 3.5INCH 320X480 550CD COLOR 70% 3/2 500 60Hz Inverter N - LG Display Co. Ltd.	
4	EAA02	PIFA Antenna, GPS	EAA62607502	KI-M24683 DUAL -2DB 5 Metal Stamping Type - KOMATECH CO., LTD	
4	EBR01	PCB Assembly, Flexible	EBR73742901	LGE510F.ABRABK 1.0 Flexible	
4	MBL00	Cap	MBL65217501	MOLD RUBBER SILICON LGE510F.ABRABK BK:Black -	
4	EAB01	Speaker, Dual Mode	EAB62509801	BRS-181027SL08B-P Nd-Fe-B 700mW 8OHM 92DB 850HZ 1810 3t DCCA wire 10mm WIRE BUJEON ELECTRONICS CO., LTD	

Level	Location No.	Description	PartNumber	Spec	Remark
4	SJMY00	Motor, DC	SJMY0007104	3V 80mA 0A 12KRPM 0RPM 0SEC 0GF.CM 0OHM	
3	GMEY00	Screw, Machine	GMEY0009201	GMEY0009201 BH + 2.7mM 3.5mM MSWR3 FZB N N LG ELECTRONICS INC.	
3	EBR00	PCB Assembly, Main	EBR74243902	LGE510.ATLFBK 1.0 Main	
5	EAX00	PCB, Sidekey	EAX64306101	LGE510F.ABRABK 1.1 POLYI Multi 2 0.18 Flexible	
5	EBP00	Camera Module	EBP61381701	LM51MI LM51MI Aptina(1/4"), 9.5x9.5x5.4t, SoC, 90degree, FPCB HANSUNG ELCOMTEC CO., LTD.	
5	ABM00	Can Assembly, Shield	ABM73676601	LGE510F.ABRABK ZZ:Without Color -	
6	MBK070300	Can, Shield	MBK63092501	PRESS SUS 304 0.3t LGE510F.ABRABK ZZ:Without Color LG-E510_Shield_Can	
6	MEV000000	Insulator	MEV63973701	COMPLEX LGE510F.ABRABK ZZ:Without Color -	
6	MEV000001	Insulator	MEV63973801	COMPLEX LGE510F.ABRABK ZZ:Without Color -	
5	RAA050100	Resin, PC	BRAH0001301	UF2040 or 3075BHF . . NONE	
4	EBR071800	PCB Assembly, Main, SMT	EBR74225402	LGE510.ATLFBK 1.0 Main	
5	MEZ000000	Label	MLAZ0038301	COMPLEX LG-VX6000 ZZ:Without Color PID Label 4 Array PRINTING,	
5	EBR071600	PCB Assembly, Main, SMT Bottom	EBR74225501	LGE510.ADEUBK 1.0 Main	
5	EBR071700	PCB Assembly, Main, SMT Top	EBR74225601	LGE510.ADEUBK 1.0 Main	
6	EAB00	Microphone, Condenser	EAB62429201	SO8OT423-09 -42DB 100OHM OMNI 1.5 TO 3.6V 3.76x2.95x1.1 SMD GoerTek Inc.	
6	EAX010000	PCB, Main	EAX64302701	LGE510F.ABRABK 1.0 FR-4 LX-BUMP 8 0.8 Main	
1	AGF000000	Package Assembly	AGF76419703	LGE510.ATLFBK ZZ:Without Color LG-E510 TLF(T3-T/TLF UB/TLF Tray/UB, MB_Seal/500ea)	
2	MAY084000	Box, Unit	MAY65374305	BOX Paper 148 93.5 56.5 4 COLOR LGE510.ATLFBK ZZ:Without Color LGE510 TLF Unit Box(T3)	
2	AGJ000000	PALLET ASSY	APLY0003201	KE500 AREBK BK, ZZ, TDR TR1-1 STD Palletizing	

Level	Location No.	Description	PartNumber	Spec	Remark
3	MBEC00	Box, Carton	MBEC0003001	COMPLEX KU250 TMDBK ZZ:Without Color -	
3	MCCL00	Cap, Box	MCCL0001701	COMPLEX KG270 AREBK ZZ:Without Color -	
3	MPBZ00	Damper	MPBZ0219601	COMPLEX KM500 ROMBB ZZ:Without Color -	
3	MPCY00	Pallet	MPCY0013203	COMPLEX KG800 DEUBK BL:Blue COMPLEX, PCX COMPLEX	
2	MFZ070200	Packing, Shell	MPAD0005814	COMPLEX LGP500.ATLFBK ZZ:Without Color -	
2	MEZ084000	Label, Unit	MLAP0001138	PRINTING LG-RD6100 RLC ZZ:Without Color GSM standard_Seal label	
2	MAY047100	Box, Master	MBEE0059801	COMPLEX KS360.AACNRD ZZ:Without Color TR1-1(=S1T.GSP1, 2.T3) Master Box	
2	MAF086500	Bag, Vinyl	MBAD0005204	COMPLEX LG-LX260 SPRAG ZZ:Without Color -	
2	MLAC00	Label, Barcode	MLAC0004541	PRINTING HB620 KPNBK ZZ:Without Color GSM standard_unit box label_90*40	
2	MLAJ00	Label, Master Box	MLAJ0004402	PRINTING CG300 CGR DG ZZ:Without Color LABEL MASTER BOX(for CGR TDR 2VER. mbox_label) GSM standard_master box label	
2	MLAZ01	Label	MLAZ0050901	COMPLEX KU990.AGBRBK ZZ:Without Color Battery Warning Label (Lithium ion Battery Label)	
1	AAD000000	Addition Assembly	AAD85991002	LGE510.ATLFBK BK:Black -	
3	MCK004100	Cover, Battery	MCK66911201	MOLD PC LGE510F.ABRABK BK:Black LG-E510_Cover_Battery	

12.2 Replacement Parts <Main component>

Note: This Chapter is used for reference, Part order is ordered by SBOM standard on GCSC

Level	Location No.	Description	PartNumber	Spec	Remark
6	R228	Resistor, Chip	ERHY0042409	RC0201FR-0749R9L 49.9OHM 1% 1/20W 0603 R/TP - YAGEO CORPORATION	
6	R1020, R1021	Resistor, Chip	ERHZ0000201	MCR01MZP5F1000 100OHM 1% 1/16W 1005 R/TP - ROHM.	
6	R401, R413	Resistor, Chip	ERHZ0000203	MCR01MZP5F1002 10KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R220	Resistor, Chip	ERHZ0000204	MCR01MZP5F1003 100KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R509, R510, R525, R526, R529, R704	Resistor, Chip	ERHZ0000206	MCR01MZP5F10R0 10OHM 1% 1/16W 1005 R/TP - ROHM.	
6	R802	Resistor, Chip	ERHZ0000221	MCR01MZP5F1502 15KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R416	Resistor, Chip	ERHZ0000222	MCR01MZP5F1503 150KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R400	Resistor, Chip	ERHZ0000243	MCR01MZP5F2201 2.2KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R417	Resistor, Chip	ERHZ0000265	MCR01MZP5F3003 300KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R411	Resistor, Chip	ERHZ0000288	MCR01MZP5F4703 470KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R408	Resistor, Chip	ERHZ0000318	MCR01MZP5F8062 80.6KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R1017	Resistor, Chip	ERHZ0000348	MCR01MZP5F12R0 12OHM 1% 1/16W 1005 R/TP - ROHM.	
6	R1018, R728	Resistor, Chip	ERHZ0000404	MCR01MZP5J102 1KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R403	Resistor, Chip	ERHZ0000405	MCR01MZP5J103 10KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R503, R512	Resistor, Chip	ERHZ0000406	MCR01MZP5J104 100KOHM 5% 1/16W 1005 R/TP - ROHM.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	R522	Resistor, Chip	ERHZ0000407	MCR01MZP5J105 1MOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R601	Resistor, Chip	ERHZ0000410	MCR01MZP5J120 12OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R508, R511	Resistor, Chip	ERHZ0000419	MCR01MZP5J150 15OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R740	Resistor, Chip	ERHZ0000434	MCR01MZP5J1R0 1OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R215, R505, R609, R610, R709, R710	Resistor, Chip	ERHZ0000443	MCR01MZP5J222 2.2KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R219	Resistor, Chip	ERHZ0000463	MCR01MZP5J330 33OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R225	Resistor, Chip	ERHZ0000483	MCR01MZP5J470 47OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R502	Resistor, Chip	ERHZ0000486	MCR01MZP5J473 47KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R402	Resistor, Chip	ERHZ0000488	MCR01MZP5J4R7 4.7OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R210, R530, R531, R532, R533, R534, R535	Resistor, Chip	ERHZ0000490	MCR01MZP5J510 51OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R1019	Resistor, Chip	ERHZ0000504	MCR01MZP5J680 68OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R1013	Resistor, Chip	ERHZ0000509	MCR01MZP5J750 75OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R1014, R1015	Resistor, Chip	ERHZ0000517	MCR01MZP5J910 91OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R523	Resistor, Chip	ERHZ0000530	RC1005J512CS 5.1KOHM 5% 1/16W 1005 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	R412	Resistor, Chip	ERHZ0000537	MCR01MZP5F6803 680KOHM 1% 1/16W 1005 R/TP - ROHM.	
6	R414	Resistor, Chip	ERHZ0004201	RC1005F1213CS 121KOHM 1% 1/16W 1005 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	U210	IC, Gate	EUSY0216301	NC7SV00P5X_NL SC70 , 5 PIN, R/TP , Single 2-Input NAND Gate FAIRCHILD SEMICONDUCTOR	
6	U402	IC, PMIC	EUSY0342201	PM7540 -0.5~18 N/A 0W CSP R/TP 137P - QUALCOMM INCORPORATED.	
6	U1000	IC, RF Transceiver, 3G	EUSY0344001	RTR6285 1.8VTO3V, 2.7VTO3V 500mW QFN R/TP 68P QUALCOMM INCORPORATED.	
6	U603	IC, LDO Voltage Regulator	EUSY0355701	RP103K281D-TR-F 1.7V TO 5.25V 2.8V 400mW DFN R/TP 4P - RICOH COMPANY, LTD.	
6	U211	IC, Digital Baseband Processor, 3G	EUSY0392303	MSM7227T 560 NSP, ARM11(600M), UPA5.7, FWGA, 8M, WVGA30fps, WM, BMP, Android BGA R/TP 560P QUALCOMM INCORPORATED.	
6	IC500	IC, Audio Sub System	EUSY0403901	WM9093ECS/R 1.71~5.5V 0W WLCSP R/TP 20P - WOLFSON MICROELECTRONICS PLC	
6	U401	IC, LDO Voltage Regulator	EUSY0407201	BU33TD4WNVX SSON004, 4, R/TP, 3.3V 150mA Single LDO, IC, LDO Voltage RegulatorIC, LDO Voltage Regulator ROHM.	
6	U212	IC, Flip Flop	EUSY0408201	74LVC1G79GM 1.65~5.5V - D FLIP-FLOP SOT R/TP 6P - STC CORP.	
6	U301	IC, MCP, NAND	EUSY0426801	MT29C4G96MAZAPCJA-5 IT FBGA , 137 , ETC , 4G(LB/256Mx16) NAND+4G(DDR400/16Mx4x32*2_2CS_2CKE) SDRAM , ; , IC, MCP MICRON SEMICONDUCTOR ASIA PTE LTD.	
6	X400	Crystal	EXXY0024301	CM315(12.5PF) 32.768KHZ 20PPM 12.5PF 32*15 SMD R/TP CITIZEN DISPLAYS CO., LTD.	
6	FL1006	Filter, Duplexer, IMT	SDMY0003001	B7697 2140000000 2112.4 to 2167.6 1950000000 1922.4 to 1977.6 2.2 1.8 2.5x2.0x0.89 DUAL SMD R/TP - EPCOS PTE LTD.	
6	VA709, VA712, VA713, VA714	Varistor	SEVY0001001	EVLC14S02050 14V 0% 50F 1.0*0.5*0.6 NONE SMD R/TP AMOTECH CO., LTD.	
6	VA708	Varistor	SEVY0003601	ICVL0505101V150FR 5.6V 0% 60F 1.0*0.5*0.55 NONE SMD R/TP INNOCHIPS TECHNOLOGY	
6	VA715, VA716, VA717, VA718, VA719	Varistor	SEVY0004301	ICVL0518100Y500FR 18V 0% 10F 1.0*0.5*0.55 NONE SMD R/TP INNOCHIPS TECHNOLOGY	
6	VA213, VA214, VA215	Varistor	SEVY0004401	ICVL0518400V500FR 18V 0% 40pF 1.0*0.5*0.55 NONE SMD R/TP INNOCHIPS TECHNOLOGY	

Level	Location No.	Description	PartNumber	Spec	Remark
6	VA501, VA502, VA503, VA504, VA506, VA507, VA509, VA510, VA511, VA512, VA513, VA514, VA515, VA516, VA517	Varistor	SEVY0005101	ICVL0518050FR 18V 0% 5F 1.0*0.5*0.55 NONE SMD R/TP INNOCHIPS TECHNOLOGY	
6	FL1000	Filter, Separator	SFAY0012501	D5017 1.5 35 35 , dB, dB, dB, dB, 4532, FEM/SP9T, Supply voltage(2.5V min, 3.2V max) EPCOS PTE LTD.	
6	FB800, FB802, FB803	Filter, Bead	SFBH0007101	BLM15AG121SN1D 120 ohm 1.0X0.5X0.5 25% 0.25 ohm 0.5A SMD R/TP 2P 0 MURATA MANUFACTURING CO., LTD.	
6	C518, FB502, FB503, FB504	Filter, Bead	SFBH0008102	BLM15HD182SN1D 1800 ohm 1.0X0.5X0.5 25% 2.2 ohm 0.2A SMD R/TP 2P 0 MURATA MANUFACTURING CO., LTD.	
6	FL600, FL601, FL602	Filter, EMI/Power	SFEY0013701	EVRC18S03Q015100R ESD/EMI 330HZ 15F 0H SMD R/TP AMOTECH CO., LTD.	
6	FL400	Filter, EMI/Power	SFEY0015301	NFM18PC104R1C3 ESD/EMI 0HZ 0.1uF 0H SMD R/TP MURATA MANUFACTURING CO., LTD.	
6	FL603	Filter, EMI/Power	SFEY0015901	ICMEF214P101MFR ICMEF214P101MFR, SMD, ESD Common mode Filter INNOCHIPS TECHNOLOGY	
6	FL401	Filter, EMI/Power	SFEY0016301	ICMEF112P900M COMMON MODE NOISE FILTER 0HZ 0F 0H SMD R/TP INNOCHIPS TECHNOLOGY	
6	FL1003	Filter, Saw	SFSY0033404	B9444 1575.42MHz 1.4*1.1*0.45 SMD R/TP 5P EPCOS PTE LTD.	
6	FL1002	Filter, Saw	SFSY0035001	B9411 2140 1.4*1.1*0.45 SMD R/TP - EPCOS PTE LTD.	
6	FL1005	Filter, Saw	SFSY0035101	B9414 1950 1.4*1.1*0.45 SMD R/TP - EPCOS PTE LTD.	
6	U1001	IC, Power Amplifier	SMPY0019101	SKY77336 SKY77336, dBm, %, A, dBc, dB, 5x5, SMD, Polar Edge for QCT SKYWORKS SOLUTIONS INC.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	U1003	Module, GPS	SMZY0021701	ALM-2412 ALM-2412, GPS LNA Module integrated Filter, 3.3x2.1x1.1 AVAGO TECHNOLOGIES INTERNATIONAL SALES PTE. LIMITED	
6	BAT700	Capacitor Assembly	SMZY0023501	PAS311HR-VG1 3.8 Backup Capacitor 0.03F, Module Assembly, KOREA TAIYO YUDEN.CO., LTD.	
6	U800	Filter, Separator, FEM	SMZY0028001	RF5501 - - - RF5501, QFN, 12p, 2.0*2.0*0.5, SP3T+LNA for BT/WiFi with BCM4325/29/30 RF MICRO DEVICES INC	
6	L1037	Capacitor, Ceramic, Chip	ECCH0000196	MCH155A0R75C 0.75pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C305, C309, C314, C444, C446, C447, C448, C449, C450, C451, C455, C456, C457, C459, C461, C515, C516, C517, C524, C534, C603, C604, C617, C618	Capacitor, Ceramic, Chip	ECCH0000198	CL05A225MQ5NSNC 2.2uF 20% 6.3V X5R - 55TO+85C 1005 R/TP . SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C1062, C1067	Capacitor, Ceramic, Chip	ECCH0000701	C1005C0G1H1R2CT000F 1.2pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - TDK CORPORATION	
6	C1070	Capacitor, Ceramic, Chip	ECCH0000901	C1005C0G1H2R2CT000F 2.2pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C1079	Capacitor, Ceramic, Chip	ECCH0002001	C1005JB0J104KT000F 0.1uF 10% 6.3V Y5P - 30TO+85C 1005 R/TP - TDK CORPORATION	
6	C306, C331, C340, C349	Capacitor, Ceramic, Chip	ECCH0005604	GRM188R60J106M 10000000 pF, 6.3V, M, X5R, TC, 1608, R/TP, 0.8 mm MURATA MANUFACTURING CO., LTD.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C820, C821	Capacitor, Ceramic, Chip	ECCH0007802	CL10A475KP8NNNC 4.7uF 10% 10V X5R -55TO+85C 1608 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C1028, C1037	Capacitor, Ceramic, Chip	ECCH0007805	CL05A106MQ5NUNC 10uF 20% 6.3V X5R - 55TO+85C 1005 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C1038, C1040, C1041, C1049, C1061	Capacitor, Ceramic, Chip	ECCH0009103	C0603C0G1H101JT00NN 100pF 5% 50V X7R - 55TO+125C 0603 R/TP - TDK CORPORATION	
6	C213	Capacitor, Ceramic, Chip	ECCH0009107	GRM033R71C222K 2.2nF 10% 16V X7R -55TO+125C 0603 R/TP - KOREA MURATA ELECTRONICS CO. LTD.	
6	C1000, C1009	Capacitor, Ceramic, Chip	ECCH0009206	GRM0335C1E680J 68pF 5% 25V X7R -55TO+125C 0603 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C1016, C1018, C1019, C1048	Capacitor, Ceramic, Chip	ECCH0009216	GRM0335C1E220J 22pF 5% 25V X7R -55TO+125C 0603 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C1059	Capacitor, Ceramic, Chip	ECCH0009226	GRM0335C1E390J 39pF 5% 25V X7R -55TO+125C 0603 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C828	Capacitor, Ceramic, Chip	ECCH0009502	GRM0335C1E1R5CD01D+A02 1.5pF 0.25PF 25V NP0 -55TO+125C 0603 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C804, C805, C806, C814, C827, C833, C834	Capacitor, Ceramic, Chip	ECCH0009514	MCH032A(AN)100DK 10pF 0.5PF 25V X7R - 55TO+125C 0603 R/TP - ROHM.	
6	C230	Capacitor, Ceramic, Chip	ECCH0010501	GRM1555C1H7R5D 7.5pF 0.5PF 50V C0G - 55TO+125C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C304, C308, C313, C711, C712	Capacitor, Ceramic, Chip	ECCH0017301	CL03A105MQ3CSNH 0.000001F 20% 6.3V X5R - 45TO+85C 0603 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C615	Capacitor, Ceramic, Chip	ECCH0017401	CL21B105KBFNNNE 1uF 10% 50V X7R -55TO+125C 2012 R/TP 1.25MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C1047, C315, C319, C431, C432, C434	Capacitor, Ceramic, Chip	ECCH0017501	CL10A226MQ8NRNE 22uF 20% 6.3V X5R -55TO+85C 1608 R/TP 0.8MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C1024, C1029, C1034, C1036, C310, C452, C453, C454, C605, C707, C817, C818, C819	Capacitor, Ceramic, Chip	ECCH0017601	CL05A475MQ5NRNC 4.7uF 20% 6.3V X5R -55TO+85C 1005 R/TP 0.5MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C316, C317, C318	Capacitor, Ceramic, Chip	ECCH0034801	CL03A474MQ3NNNH 0.47 uF, 6.3V, M, X5R, HD, 0603, R/TP, 0.0000047, 20%, 6.3V, X5R, -55TO+85C, 0603, R/TP, .3 mm SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C442, C443	Capacitor, TA, Conformal	ECTH0002002	F981A336MSA 33uF 20% 10V 3.3A -55TO+85C 6OHM 2.2X1.1X1.1MM NONE SMD R/TP - NICHICON CORPORATION, EAST JAPAN SALES OFFICE	
6	C613	Capacitor, TA, Conformal	ECTH0003701	TCSCM0J106MJAR 10 uF, 6.3V, M, L_ESR, 1608, R/TP SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C504, C528	Capacitor, TA, Conformal	ECTH0004807	TCM1A106M8R 10F 20% 10V 500mA -55TO+85C 15OHM - - SMD R/TP ROHM.	
6	C217	Capacitor, Ceramic, Chip	ECZH0000803	C1005C0G1H020CT000F 2pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C800	Capacitor, Ceramic, Chip	ECZH0000806	C1005C0G1H050CT000F 5pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C1001, C1007, C1051, C1055, C1071, C1094, C413, C610	Capacitor, Ceramic, Chip	ECZH0000830	C1005C0G1H330JT000F 33pF 5% 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C1069	Capacitor, Ceramic, Chip	ECZH0000839	C1005C0G1H4R7CT000F 4.7pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C507, C508	Capacitor, Ceramic, Chip	ECZH0001210	C1005Y5V1A474ZT000F 470nF -20TO+80% 10V Y5V -30TO+85C 1005 R/TP - TDK KOREA COOPERATION	
6	C400, C407, C408, C410, C445, C502, C511, C514, C619, C702, C703, C822	Capacitor, Ceramic, Chip	ECZH0001215	C1005X5R1A105KT000F 1uF 10% 10V X5R -55TO+85C 1005 R/TP - TDK KOREA COOPERATION	
6	C810	Capacitor, Ceramic, Chip	ECZH0001216	C1005X5R1A224KT000E 220nF 10% 10V X5R -55TO+85C 1005 R/TP - TDK KOREA COOPERATION	
6	C218, C220, C222, C223, C224, C225, C226, C227, C409, C412, C415, C416, C417, C418, C419, C420, C421, C439, C462, C521, C525, C531, C700, C716, C808, C815, C823, C824, C825, C826	Capacitor, Ceramic, Chip	ECZH0003103	GRM36X7R104K10PT 100nF 10% 10V X7R -55TO+125C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C509, C510	Capacitor, Ceramic, Chip	ECZH0003126	GRM155R71A393K 39nF 10% 10V X7R -55TO+125C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C403	Capacitor, Ceramic, Chip	ECZH0003503	GRM188R61E105K 1uF 10% 25V X5R -55TO+85C 1608 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C1045	Capacitor, Ceramic, Chip	ECZH0025908	GRM0335C1E8R0D 8pF 0.5PF 25V C0G -55TO+125C 0603 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C1031, C1057, C1058, C1085, C232, C505	Capacitor, Ceramic, Chip	ECZH0025916	GRM0335C1E330J 33pF 5% 25V NP0 -55TO+125C 0603 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C1022, C1090, C1091, C1092, C1093, C210, C327, C328, C329, C339, C424, C425, C427, C428, C429, C430, C611	Capacitor, Ceramic, Chip	ECZH0025920	GRM033R71C102K 1nF 10% 16V X7R -55TO+125C 0603 R/TP - MURATA MANUFACTURING CO., LTD.	
6	D700	Diode, Switching	EDSY0011901	SDB310Q 340mV 30V 200mA 1A 0SEC 150mW EMD2 R/TP 2P 1 AUK CORP	
6	D601	Diode, Switching	EDSY0017701	SDB1040 550mV 40V 1A 30A 0SEC 0W SOD123 R/TP 2P 1 AUK CORP	
6	ZD401	Diode, TVS	EDTY0008601	PSD05-LF 5V 6 13.5V 42A 500W SOD323 R/TP 2P 1 PROTEK DEVICES INC.	
6	ZD400	Diode, TVS	EDTY0008602	PSD12-LF 12V 13.3 25.9V 21A 500W SOD323 R/TP 2P 1 PROTEK DEVICES INC.	
6	D401	Diode, TVS	EDTY0008606	PRSB6.8C 4.7V 5.7 - - 10W - R/TP 2P 1 PROTEK DEVICES INC.	
6	ZD500, ZD501	Diode, TVS	EDTY0008610	PLW0501H-LF 800mV 6V 12.5V 16A 250W SOD523 R/TP 2P 1 PROTEK DEVICES INC.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	D600, D602	Diode, TVS	EDTY0009801	VSMF05LCC 5V 6V 12V 2A 25W SOT-963 R/TP 6P 5 PROTEK DEVICES INC.	
6	D400, D500, D501, D502, ZD1, ZD502, ZD700, ZD701	Diode, TVS	EDTY0010101	ESD9B5.0ST5G ESD9B5.0ST5G, SOD-923, 5 V, 300 mW, R/TP, 15pF SCG HONG KONG SAR LTD.	
6	ZD402, ZD403	Diode, TVS	EDTY0012101	PESD5V0F1BL SOD882, 5.5 V, W, R/TP, 5.5V, 10V, 15V, 2.5A, 2P, 1 STC CORP.	
6	L1007	Inductor, Multilayer, Chip	ELCH0001031	HK1005 15NJ-T 15NH 5% - 300mA 0.46OHM 2.3GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	C835	Inductor, Multilayer, Chip	ELCH0001039	HK1005 2N7S-T 2.7NH 0.3NH - 300mA 0.13OHM 6GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	C1064	Inductor, Multilayer, Chip	ELCH0001040	HK1005 3N9S-T 3.9NH 0.3NH - 300mA 0.21OHM 4GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	C1002, C1010, L1028	Inductor, Multilayer, Chip	ELCH0001054	1005GC2T5N6SLF 5.6NH 0.3NH - 300mA 0.27OHM 3.2GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP PILKOR ELECTRONICS LTD.	
6	C1084	Inductor, Multilayer, Chip	ELCH0001403	LL1005-FHL1N0S 1NH 0.3NH - 400mA 0.1OHM 20GHZ 7 SHIELD NONE 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	C1052, C1097	Inductor, Multilayer, Chip	ELCH0001404	LL1005-FHL1N5S 1.5NH 0.3NH - 400mA 0.13OHM 15GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	C1073, L1033, L1036	Inductor, Multilayer, Chip	ELCH0001405	LL1005-FHL3N3S 3.3NH 0.3NH - 400mA 0.16OHM 9.1GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	C1099, L1018, L1025	Inductor, Multilayer, Chip	ELCH0001412	LL1005-FHL1N8S 1.8NH 0.3NH - 400mA 0.14OHM 15GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	L1017	Inductor, Multilayer, Chip	ELCH0001413	LL1005-FHL22NJ 22NH 5% - 300mA 0.7OHM 2.5GHZ 10 SHIELD NONE 1.0X0.5X0.5MM R/TP TOKO, INC.	
6	C1056, C1087, L1002, L1005	Inductor, Multilayer, Chip	ELCH0003819	LQG15HS12NJ02D 12NH 5% - 300mA - - 0.28OHM 3GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP MURATA MANUFACTURING CO., LTD.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C1082, L1032	Inductor, Multilayer, Chip	ELCH0003820	LQG15HS3N0S02D 3NH 0.3NH - 300mA 0.17OHM 6GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP MURATA MANUFACTURING CO., LTD.	
6	L800	Inductor, Multilayer, Chip	ELCH0003828	LQG15HS2N4S02D 2.4NH 0.3NH - 300mA 0.15OHM 6GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP MURATA MANUFACTURING CO., LTD.	
6	L1023	Inductor, Multilayer, Chip	ELCH0003842	LQG15HSR10J02D 100NH 5% - 150mA - - 1.25OHM 600MHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP MURATA MANUFACTURING CO., LTD.	
6	L801	Inductor, Multilayer, Chip	ELCH0004109	LLV0603-FH2N7S 2.7NH 0.3NH - 250mA 0.23OHM 6GHZ 5 SHIELD NONE 0.6X0.3X0.3MM R/TP TOKO, INC.	
6	L803	Inductor, Multilayer, Chip	ELCH0004111	LLV0603-FH3N9S 3.9NH 0.3NH - 250mA 0.28OHM 5GHZ 5 SHIELD NONE 0.6X0.3X0.3MM R/TP TOKO, INC.	
6	L1010	Inductor, Multilayer, Chip	ELCH0004118	LLV0603-FH15NJ 15NH 5% - 180mA 0.75OHM 2GHZ 6 SHIELD NONE 0.6X0.3X0.3MM R/TP TOKO, INC.	
6	L1009	Inductor, Multilayer, Chip	ELCH0004714	1005GC2T18NJLF 18NH 5% - 200mA 0.65OHM 1.6GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP PILKOR ELECTRONICS LTD.	
6	L1012	Inductor, Multilayer, Chip	ELCH0004718	1005GC2T5N6SLF 5.6NH 0.3NH - 300mA 0.27OHM 3.2GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP PILKOR ELECTRONICS LTD.	
6	L500	Inductor, Multilayer, Chip	ELCH0010402	LK1005 R27K-T 270NH 10% - 25mA 0.91OHM 120MHZ 10 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	L1001	Inductor, Multilayer, Chip	ELCH0012503	LQW15AN56NJ00D 56NH 5% - 200mA 1.17OHM 2.8GHZ 25 NON SHIELD NONE 1.0X0.5X0.5MM R/TP MURATA MANUFACTURING CO., LTD.	
6	L1015	Inductor, Multilayer, Chip	ELCH0012508	LQP15MN2N0B02D 2NH 0.1NH - 220mA 0.3OHM 6GHZ 13 SHIELD NONE 1.0X0.5X0.35MM R/TP MURATA MANUFACTURING CO., LTD.	
6	L402, L403	Inductor, Wire Wound, chip	ELCP0008001	MIP2520D4R7M 4.7UH 30% 0V 1.1A 0.11OHM 0HZ 0 SHIELD 2.5X2X1MM NONE R/TP FDK CORPORATION.	
6	L600	Inductor, Wire Wound, chip	ELCP0009407	VLS3010T-220MR46 VLS3010T-220MR46, 22 uH, M, 3X3X1.0, R/TP, Power coil TDK CORPORATION	
6	L802	Inductor, Wire Wound, Chip	ELCP0009409	LQM2HPN2R2MG0L 2.2UH 20% - 1.3A 0.08OHM 40MHZ - SHIELD 2.5X2X1MM NONE R/TP MURATA MANUFACTURING CO., LTD.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	CN601	Connector, BtoB	ENBY0034201	GB042-24S-H10-E3000 24P 0.40MM STRAIGHT SOCKET SMD R/TP 1M - LS Mtron Ltd.	
6	CN600	Connector, BtoB	ENBY0040301	GB042-34S-H10-E3000 34P 0.4MM STRAIGHT SOCKET SMD R/TP 1M - LS Mtron Ltd.	
6	CN701, CN702	Connector, BtoB	ENBY0051001	GB042-10S-H10-E3000 10P 0.4MM STRAIGHT FEMALE SMD R/TP 1M - LS Mtron Ltd.	
6	CN400	Connector, I/O	ENRY0011001	20-5151-005-102-883 5P 0.65MM ANGLE RECEPTACLE DIP R/TP - KYOCERA ELCO KOREA SALES CO., LTD.	
6	J501	Card Socket	ENSY0022101	GCA26C-6S-H15-E1500 GCA26C-6S-H15-E1500, 6, ETC2.54 mm, H=1.5 LS Mtron Ltd.	
6	SW1000	Connector, RF	ENWY0008701	MS-156C NONE STRAIGHT SOCKET SMD T/REEL AU 50OHM 400mDB HIROSE KOREA CO., LTD	
6	CN401	Connector, Terminal Block	ENZY0030401	KQ03LV-3R 3, 2.5 mm, STRAIGHT, Gold, Twin One board 5.4mm HIROSE KOREA CO., LTD	
6	R415	Resistor, Chip	ERHY0000105	MCR01MZP5F51R0 51OHM 1% 1/16W 1005 R/TP - ROHM.	
6	R221, R222, R223, R224, R705, R706, R707, R708	Resistor, Chip	ERHY0000254	MCR01MZP5J472 4.7KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R516, R517, R518, R520, R521	Resistor, Chip	ERHY0000275	MCR01MZP5J563 56KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	R212, R729, R730, R733, R734	Resistor, Chip	ERHY0003301	MCR01MZP5J101 100OHM 5% 1/16W 1005 R/TP - ROHM.	
6	R805	Resistor, Chip	ERHY0003501	RC1005J221CS 220OHM 5% 1/16W 1005 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	R213	Resistor, Chip	ERHY0009302	MCR006YZPF1001 1KOHM 1% 1/20W 0603 R/TP - ROHM.	
6	R1007	Resistor, Chip	ERHY0009501	MCR006YZPJ000 0OHM 5% 1/20W 0603 R/TP - ROHM.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	R230, R232, R234	Resistor, Chip	ERHY0009503	MCR006YZPJ101 100OHM 5% 1/20W 0603 R/TP - ROHM.	
6	R1003, R1004, R1005, R1006, R1016	Resistor, Chip	ERHY0009504	MCR006YZPJ102 1KOHM 5% 1/20W 0603 R/TP - ROHM.	
6	R211, R214, R227, R300	Resistor, Chip	ERHY0009505	MCR006YZPJ103 10KOHM 5% 1/20W 0603 R/TP - ROHM.	
6	R1012	Resistor, Chip	ERHY0009516	MCR006YZPJ222 2.2KOHM 5% 1/20W 0603 R/TP - ROHM.	
6	R1009	Resistor, Chip	ERHY0009524	MCR006YZPJ470 47OHM 5% 1/20W 0603 R/TP - ROHM.	
6	R720, R721, R722	Resistor, Chip	ERHY0009526	MCR006YZPJ472 4.7KOHM 5% 1/20W 0603 R/TP - ROHM.	
6	R235, R302	Resistor, Chip	ERHY0009536	MCR006YZPF1003 100KOHM 1% 1/20W 0603 R/TP - ROHM.	
6	R419	Resistor, Chip	ERHY0009547	MCR006YZPF2003 200KOHM 1% 1/20W 0603 R/TP - ROHM.	
6	R1002	Resistor, Chip	ERHY0009555	MCR006YZPF1202 12KOHM 1% 1/20W 0603 R/TP - ROHM.	
6	R226	Resistor, Chip	ERHY0009592	MCR006YZPJ202 2KOHM 5% 1/20W 0603 R/TP - ROHM.	
6	R513, R514	Resistor, Chip	ERHY0018001	RC0201JR-0720RL 20OHM 5% 1/20W 0603 R/TP - YAGEO CORPORATION	
6	R217	Resistor, Chip	ERHY0024201	RC1005F6041CS 6.04KOHM 1% 1/16W 1005 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	R711	Resistor, Chip	ERHY0040401	RC1005F5R6CS 5.6OHM 1% 1/16W 1005 R/TP - SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	R1010, R1011	Resistor, Chip	ERHY0042403	RC0201JR-07130RL 130OHM 5% 1/20W 0603 R/TP - YAGEO CORPORATION	
6	C219, C221, C458, C460, C705, C715	Capacitor, Ceramic, Chip	ECCH0004904	GRM155R60J105K 1uF 10% 6.3V X5R -55TO+85C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C1077, C423, C426, C433, C501, C614, C701, C704, C811	Capacitor, Ceramic, Chip	ECCH0007803	CL10A106MP8NNNC 10uF 20% 10V X5R -55TO+85C 1608 R/TP 0.8MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C411, C422, C523, C620, C807	Capacitor, Ceramic, Chip	ECCH0007804	CL05A225MP5NSNC 2.2uF 20% 10V X5R -55TO+85C 1005 R/TP 0.5MM SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	C1017, C1023, C1027, C1030, C1033, C1035, C1039, C1042, C1043, C1044, C1050, C1060, C211, C234, C235, C300, C301, C302, C307, C330, C332, C333, C334, C341, C342, C343, C344, C346, C347, C348	Capacitor, Ceramic, Chip	ECCH0009101	C0603X5R0J104KT00NN 0.1uF 10% 6.3V X5R -55TO+85C 0603 R/TP - TDK CORPORATION	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C350, C351, C352, C353, C436, C512, C513, C612, C706, C812, C813	Capacitor, Ceramic, Chip	ECCH0009101	C0603X5R0J104KT00NN 0.1uF 10% 6.3V X5R -55TO+85C 0603 R/TP - TDK CORPORATION	
6	C1004, C1006, C214, C311, C320, C321, C322, C323, C324, C325, C326, C335, C336, C337, C338, C345, C354, C355	Capacitor, Ceramic, Chip	ECCH0009106	C0603X7R1C103KT 10nF 10% 10V X7R -55TO+125C 0603 R/TP - TDK CORPORATION	
6	C1046, C233	Capacitor, Ceramic, Chip	ECCH0009203	GRM033R60J333K 33nF 10% 6.3V X5R -55TO+85C 0603 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C1003, C1080, C441, C801, L1011, L1029, L1031, L804	Capacitor, Ceramic, Chip	ECZH0000813	C1005C0G1H101JT 100pF 5% 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C1013, L1026	Capacitor, Ceramic, Chip	ECZH0000822	C1005C0G1H1R5CT000F 1.5pF 0.25PF 50V NP0 -55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	L1041	Diode, TVS	EDTY0010501	RCLAMP1521P.TCT 15V 16.7 28V 4A 0W SLP1006P2 R/TP 2P 1 SEMTECH CORPORATION	
6	C1014, C1020, C1100, L1021	Inductor, Multilayer, Chip	ELCH0004713	1005GC2T6N8JLF 6.8NH 5% - 250mA 0.32OHM 3GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP PILKOR ELECTRONICS LTD.	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C1068, C1072, C1101, L1003, L1039, L1040	Inductor, Multilayer, Chip	ELCH0005020	HK1005 1N0S 1NH 0.3NH - 300mA 0.08OHM 10GHZ 8 SHIELD NONE 1.0X0.5X0.5MM R/TP TAIYO YUDEN CO., LTD	
6	L1022, L1024, VA800	Varistor	SEVY0007301	ULCE0505C015FR 5V 0% 0.5F 1.0*0.5*0.55 NONE SMD R/TP INNOCHIPS TECHNOLOGY	
6	C1011	Capacitor, Ceramic, Chip	ECCH0000108	C1005NP0709DGT 7pF 0.5PF 50V NP0 -55TO+125C 1005 R/TP - NEOTECH CO., LTD	
6	C1098, C816	Capacitor, Ceramic, Chip	ECCH0000110	MCH155A100D 10pF 0.5PF 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C212, C228, C519, C520	Capacitor, Ceramic, Chip	ECCH0000122	MCH155A470JK 47pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C1021, C1025, C1026, C1032	Capacitor, Ceramic, Chip	ECCH0000183	GRM1555C1H1R8C 1.8pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C809	Capacitor, Ceramic, Chip	ECCH0000133	C1005X7R1H221KT000F 0.22nF 10% 50V X7R - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C215, C216, C229	Capacitor, Ceramic, Chip	ECCH0000137	C1005X7R1H331KT000F 0.33nF 10% 50V X7R - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	
6	C1063, C1074	Capacitor, Ceramic, Chip	ECCH0000195	GRM1555C1H3R9C 3.9pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C503, C506, FB805	Capacitor, Ceramic, Chip	ECCH0000143	MCH155CN102KK 1nF 10% 50V X7R -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	Q502	FET	EQFP0004501	SI1305-E3 P-CHANNEL MOSFET -8V +-8 -0.92A 0.28OHM 340mW SOT323 R/TP 9P VISHAY INTERTECHNOLOGY ASIA PTE LTD	
6	L1013	Capacitor, Ceramic, Chip	ECCH0000185	GRM1555C1H5R6C 5.6pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - MURATA MANUFACTURING CO., LTD.	
6	C1086	Capacitor, Ceramic, Chip	ECCH0001001	C1005C0G1H6R8CT000F 6.8pF 0.25PF 50V NP0 - 55TO+125C 1005 R/TP - TDK KOREA COOPERATION	

Level	Location No.	Description	PartNumber	Spec	Remark
6	R605, R606, R607, R608	Resistor, Chip	ERHZ0000485	MCR01MZP5J472 4.7KOHM 5% 1/16W 1005 R/TP - ROHM.	
6	ANT1001, ANT1002, ANT1004	Contact	MCIZ0008401	COMPLEX LG-C900 ATTDW ZZ:Without Color PRESS, BeCu, , 3.0, 1.2, 1.5,	
6	FL1001	Filter, Duplexer, IMT	SDMY0002801	B7953 942500000 925 to 960 897500000 880 to 915 3.8 2.9 2.5x2.0x0.94 DUAL SMD R/TP - EPCOS PTE LTD.	
6	FL1004	Filter, Saw	SFSY0037601	B9442 897.5MHz 1.4*1.1*0.4 SMD R/TP 5P EPCOS PTE LTD.	
6	U1002	IC, Power Amplifier	SMPY0020001	SKY77195 SKY77195, 28 dBm, %, A, dBc, dB, 4x5, SMD, 3G Dual PAM Band 1+8. CPL integrated SKYWORKS SOLUTIONS INC.	
6	C1008	Capacitor, Ceramic, Chip	EAE62282201	GRM033R71E102KA01D 0.000000001F 10% 25V X7R -55TO+125C 0603 R/TP 0.3+/-0.03 MM MURATA MANUFACTURING CO., LTD.	
6	C1076, C312, C714	Capacitor, Ceramic, Chip	EAE62286801	CL03A104KP3NNNC 0.0000001F 10% 10V X5R - 55TO+85C 0603 R/TP 0.3 SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	CN100	Socket, Card	EAG62830201	104031-0811 SD 8P ANGLE SMD R/TP 11.95x11.40x1.42t, Push-pull type MOLEX	
6	J500	Jack, Phone	EAG62831701	KJA-PH-3-0176 4P 4P ANGLE R/TP 3.5M BLACK 5P 6.5x12.6x4.0t, Short Detect, All DIP type KSD CO., LTD	
6	D1, D211, D402	Diode, Switching	EAH61532901	BA891_ 1V 35V - - 0SEC 715mW SOD523 R/TP 2P 1 NXP Semiconductors	
6	FB200	Filter, Bead	EAM62131101	CIM05U221NC 220 ohm 1.0X0.5X0.5 25% 0.35 ohm 0.5A SMD R/TP 2P 0 SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	FB500, FB501, FB801, FB804	Filter, Bead	EAM62150401	CIC05J601NC 600 ohm 1.0X0.5X0.5 25% 0.6 ohm 0.5A SMD R/TP 2P 0 SAMSUNG ELECTRO-MECHANICS CO., LTD.	
6	Q500	FET	EBK61592701	RZE002P02TL P-CHANNEL MOSFET -20V +-10 200mA 1.5OHM 150mW EMT3 R/TP 3P ROHM Semiconductor KOREA CORPORATION	
6	C522	Capacitor, Ceramic, Chip	ECCH0000112	MCH155C150J 15pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	

Level	Location No.	Description	PartNumber	Spec	Remark
6	C1078, C1096, C830, C831	Capacitor, Ceramic, Chip	ECCH0000113	MCH155A180J 18pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C402, C404, C440, C463, C464, C529, C530, C532	Capacitor, Ceramic, Chip	ECCH0000115	MCH155A220JK 22pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C500	Capacitor, Ceramic, Chip	ECCH0000120	MCH155A390J 39pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	C1075	Capacitor, Ceramic, Chip	ECCH0000127	MCH155A820J 82pF 5% 50V NP0 -55TO+125C 1005 R/TP - ROHM Semiconductor KOREA CORPORATION	
6	FL800	Filter, Ceramic	EAM62250401	LFB212G45CG7D227 BPF 2.45KHZ 100Hz SMD R/TP 3P MURATA MANUFACTURING CO., LTD.	
6	U801	IC, LAN	EAN61970501	BCM4330FKFFBG 2.3V 5.5V 2.3V 5.5V 1.2V 2.9V 1.2W FCBGA R/TP 144P 2.4GHz Single Band BROADCOM ASIA DISTRIBUTION PTE LTD	
6	U704	IC, Reset	EAN62009101	FT7521L6X 2~5V 0~5V 5mW MICROPAK R/TP 6P 1-Input Reset IC, Delay 7.5s FAIRCHILD SEMICONDUCTOR HONG KONG LTD.	
6	U701	IC, Acceleration Sensor	EAN62027201	K3DH 3 Axis Acceleration Sensor 3X3X1 LGA R/TP 16P 3 Axis Accelerometer Sensor ST MICROELECTRONICS ASIA PACIFIC PTE LTD.	
6	U400	IC, Mini ABB	EAN62095301	RT8965 Mini ABB Basic, MUIC, Charger IC Integrated WLCSP R/TP 25P RICHTEK TECHNOLOGY CORP.	
6	U601	IC, DC, DC Converter	EAN62186901	LM3530TMX-40 NOPB 2.7 to 5.5V adj 0W CSP R/TP 12P - NATIONAL SEMICONDUCOTR CORPORATION.	
6	L400, L401	Inductor, Wire Wound, Chip	EAP61746201	1239AS-H-4R7N=P2 4.7UH 30% - 1A - - 0.252OHM - - SHIELD 2.5X2MM NONE R/TP TOKO, INC.	
6	X800	Crystal	EAW61503601	1ZZCAB37400AA0A 37.4MHZ 10PPM 12F ; SMD R/TP DAISHINKU CORPORATION.	
6	X210	Oscillator, VCTCXO	EAW61543601	X1G003581002700 19.2MHZ 2PPM 2.8V 2.5x2.0x0.8MM ; SMD R/TP EPSON TOYOCOM CORP	

Level	Location No.	Description	PartNumber	Spec	Remark
6	U700	IC, Magnetic Sensor	EBD60985501	AMI306 1.7 to 3.6V - QFN R/TP 8P - AICHI STEEL CORPORATION	
6	R218, R801	PCB ASSY, MAIN, PAD OPEN	SAFO0000401	AX3100 ATL SV_SHIPBACK, MAIN, A, 0OHM DNI	
6	FB1000, FB1001, FB1002, FB1003, R1, R1001, R2, R301, R303, R304, R418, R800, R803, R804, R806	PCB ASSY, MAIN, PAD SHORT	SAFP0000401	LG-LU3000 LGTBK, MAIN, A,	
6	C400, C407, C408, C410, C445, C502, C511, C514, C619, C702, C703, C822	Capacitor, Ceramic, Chip	ECZH0001215	C1005X5R1A105KT000F 1uF 10% 10V X5R - 55TO+85C 1005 R/TP - TDK KOREA COOPERATION	
6	VA709, VA712, VA713, VA714	Varistor	SEVY0001001	EVLC14S02050 14V 0% 50F 1.0*0.5*0.6 NONE SMD R/TP AMOTECH CO., LTD.	
6	R219	Resistor, Chip	ERHZ0000463	MCR01MZP5J330 33OHM 5% 1/16W 1005 R/TP - ROHM.	
6	U702	IC, Proximity	EUSY0376201	GP2AP002S00F GP2AP002S00F, 8, R/TP SHARP CORPORATION.	
6	LD700, LD701, LD702	LED, Chip	EDLH0014803	SSC-WH107 WHITE 2.7~3.1 20mA 100~230mcd x, y 64mW 1608 R/TP 2P - SEOUL SEMICONDUCTOR CO., LTD	

12.3 Accessory

Note: This Chapter is used for reference, Part order is ordered by SBOM standard on GCSC

Level	Location No.	Description	PartNumber	Spec	Remark
2	EAY060000	Adapters	SSAD0038301	100-240V, 5060 Hz, 5.1 V, 700 mA, CE, AC-DC Adaptor, 90Vac~264Vac, 5.1V, 700mA, 5060, WALL 2P, USB,	
2	MFL053800	Manual, Operation	MFL67362508	COMPLEX LGE510.ATLFBK ZZ:Without Color -	
2	MBM062600	Card, Quick Reference	MBM63556608	PRINTING LGE510.ATLFBK ZZ:Without Color -	
2	ACQ02	Cover Assembly, Battery	ACQ85722001	LGE510F.ABRABK BK:Black -	
2	EAB010200	Earphone, Stereo	SGEY0003744	EMB-LGE004MSKB 3mW 16OHM 115DB 85HZTO126HZ 1M BLACK 3.5 L TYPE STEREO 4POLE PLUG - CRESYN CO., LTD	
2	EBX000000	Accessory, Data Cable	SGDY0016701	KCA-ET-8-0020 KCA-ET-8-0020 Micro USB, 1.2M KSD CO., LTD	
2	EAC00	Rechargeable Battery, Lithium Ion	EAC61700011	BL-44JN-WWD-TOCAD PRISMATIC 3.7V 1.5AH 300mAH 61x44x4.4 65x44x4.8 BLACK Bar type, Top cap Screw joint 444461, 1500mAh, Bar Type (Top cap screw joint), WW, down TOCAD DONGHWA	